7411B

CALIBRATION AT A
KEYSTROKE SOFTWARE

used with **7404B 7449A A123**

Manual Set 1

FLUKE®

7411B

CALIBRATION SOFTWARE

used with ***7404B 7449A A123***

Manual Set 1

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7411B

CALIBRATION SOFTWARE

How To Use These Manuals

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INTRODUCTION

Thank you for purchasing the 7411B Calibration Software package from Fluke. This "How to Use These Manuals" section of the 7411B Manual Set is a guide to the rest of the 7411B manuals. Unless you have also purchased a 7404B or 7449A, please skip to page 2-1 and continue reading from there.

NOTE:

A summary of the differences between the 7411A and 7411B Calibration Software is in Section 1 of the 7411B Configuration Manual. (Procedures developed for the 7411A will also run on a 7411B system.)

7404B Notice

If you have purchased a 7404B, read the 7404B Getting Started Guide, beginning on the next page. Skip to page 2-1 when you have finished reading the 7404B Getting Started Guide.

7449A Notice

If you have purchased a 7449A, skip to page 1-5 and continue reading from there.

7404B GETTING STARTED GUIDE

Thank you for purchasing a 7404B Meter Calibration Cluster from Fluke. This 7404B Getting Started Guide provides information that will help you start using it right away. The topics discussed below are cross-referred to pages in the 7411B Configuration Manual which is located in Volume 2.

Installing a 7404B

The 7404B is configured from standard hardware and software building blocks. Since the 7404B is derived from these building blocks, it doesn't have a separate manual. Pages 3-11 through 3-20 of the 7411B Configuration Manual provide application notes and installation information for the 7404B. Refer to the information on these pages as you unpack and assemble your 7404B.

Configuring the 7411B for a 7404B

Read pages 4-1 through 4-14 of the 7411B Configuration Manual to familiarize yourself with the expansion capabilities and other advantages of the 7411B software. The Instrument Calibration and Procedure Generator Editor capabilities of the 7411B software package, included with your 7404B, are pre-configured for immediate use as a 7404B. If you don't want to add other instruments to your 7404B at this time, you won't need to use the 7411B Configuration Utility disk as described in the step-by-step instructions in the 7411B Configuration manual (the instructions begin on page 4-15). If you do want to add calibration instruments to your 7404B, please refer to the instructions in the 7411B Configuration Manual, beginning on page 4-15.

Translating and Editing 7404B Procedures

The 7411B software provides the 7404B operator with automatic messages. The messages are controlled by the 7411B ASK+ and ASK- Function Selection Codes (FSCs or drivers). FSCs are entered into the calibration procedure by the procedure writer (see the 7411B Procedure Writing Manual for detailed information on writing or editing procedures, and refer to the information on the ASK+ and ASK- FSCs in particular). The 7404B's default for these FSCs is ASK- D. The Fluke example meter calibration procedures supplied with the 7411B software are compatible with this default.

Adding a Printer or Bar Code Reader

If you wish to add an RS-232 printer or a bar code reader to your 7404B, please read the information in the 7411B Configuration Manual, pages 4-71 through 4-72.

7449A GETTING STARTED GUIDE

Thank you for purchasing a 7449A Meter/Oscilloscope Calibration Cluster from Fluke. This 7449A Getting Started Guide provides information that will help you start to use it right away. The topics discussed below are cross-referred to pages in the 7411B Configuration Manual which is located in Volume 2.

Installing a 7449A

The 7449A is configured from standard hardware and software building blocks. Since the 7449A is derived from these building blocks, it doesn't have a separate manual. Pages 3-27 through 3-35 of the 7411B Configuration Manual provide application notes and installation information for the 7449A. Refer to the information on these pages as you unpack and assemble your 7449A.

Configuring the 7411B For a 7449A

Read pages 4-1 through 4-14 of the 7411B Configuration Manual to familiarize yourself with the expansion capabilities and other advantages of the 7411B software. The Instrument Calibration and Procedure Generator Editor capabilities of the 7411B software package, included with your 7449A, are pre-configured for immediate use as a 7449A. If you don't want to add other instruments to your 7449A at this time, you won't need to use the 7411B Configuration Utility disk as described in the step-by-step instructions in the 7411B Configuration Manual (the instructions begin on page 4-15). If you do want to add calibration instruments to your 7449A, please refer to the instructions in the 7411B Configuration Manual, beginning on page 4-15.

Translating and Editing 7449A Procedures

The 7411B software provides automatic messages for the operator of the 7449A. These messages are controlled by the 7411B ASK+ and ASK- Function Selection Codes (FSCs or drivers). The FSCs are entered into the calibration procedure by the procedure writer (see the 7411B Procedure Writing Manual for detailed information on writing or editing procedures, and refer to the information on the ASK+ and ASK- FSCs in particular). The 7449A default for these FSCs is ASK+ D. You must insert an ASK- D FSC into the Fluke example meter calibration procedures supplied with the 7411B software in order to make the automatic setup messages for the 7449A operator apply to meters rather than to oscilloscopes. If you write a calibration procedure for an oscilloscope with a built-in meter, you must insert the ASK- D FSC at the entry point to the portions of the procedure that apply to the meter. Use the ASK+ D FSC whenever you return to the portions of the procedure that apply to oscilloscopes. Refer to pages 4-54 through 4-70 of the 7411B Configuration Manual for more information about translating and editing procedures supplied with the 7411B.

Adding a Printer or Bar Code Reader

If you wish to add an RS-232 printer or a bar code reader to your 7449A, please read the information in the 7411B Configuration Manual, pages 4-71 through 4-72.

Section 2
What are the 7411B Manuals?

INTRODUCTION

The 7411B Manual Set is provided in two volumes. These manuals are intended to be used by various people during the life cycle applications of a calibration cluster or workstation. The manuals, their users and the times that they are used during the system life cycle are all described in this and succeeding sections of this manual.

THE 7411B MANUALS

Major Manuals

There are four major manuals in the 7411B manual set and two supplementary manuals.

The major manuals are:

- Configuration Manual
- Introductory Training Manual
- Procedure Writing Manual
- Operator Manual

Supplementary Manuals

The supplementary manuals are:

- 5200A-800 Manual
- System Builder's Guide

The users of these manuals are discussed in the next section, Who Uses the 7411B Manuals.

Section 3
Who Uses the 7411B Manuals?

CATEGORIES OF USERS

There are primary and secondary users of the 7411B manuals. These are identified below, and a brief description of their role in the applications of a calibration system follows.

Primary Users

- o System Manager
- o Procedure Writer
- o System Operator

Role of the Primary Users

The primary users of the manuals need to be familiar with the manual contents in order to successfully install, operate, and manage either a Fluke-supplied or user-configured cluster or workstation.

A system manager has the overall responsibility for the successful application of a calibration system. He or she manages system usage. The System Manager should be familiar with the Configuration Manual, the Introductory Training Manual, the Procedure Writing Manual and the Operator Manual.

A procedure writer is an expert in calibration (for example, a calibration engineer or a senior calibration technician). He or she writes or edits calibration procedures. A procedure writer does not need to write sophisticated programs in a programming language such as BASIC. However, in order to use all of the 7411B's procedure writing capabilities, casual programming skills in BASIC are an asset for the procedure writer. The procedure writer should be familiar with the same manuals as the system manager, and with the 5200A-800 manual when an accuracy enhanced Fluke Model 5200A AC Calibrator is controlled by the 7411B.

A system operator is an integral part of the calibration system during the execution of the procedures. He or she follows CRT displayed instructions and provides appropriate responses to the system via a simplified keypad during execution of a 7411B calibration procedure. In many environments, the operator is not technically skilled and is very comfortable with following highly predictable routines. An operator need only be familiar with the Operator Manual.

Secondary User

The secondary user of the manuals is a system engineer. A system engineer is only involved when the system is user configured.

A system engineer is responsible for the successful design, development, integration and operation of a user configured cluster or workstation. A system engineer is not needed to support standard Fluke 7400 or A123 series systems. The system engineer should be familiar with the Procedure Writing Manual and the Operator Manual. He or she may also use the 5200A-800 manual and might wish to consult the System Builder's Guide.

Section 4
When Are the 7411B Manuals Used?

LIFE CYCLE PHASES OF A CALIBRATION SYSTEM

The primary uses of the 7411B manuals occur during different portions of the life cycle of a system. The principle phases of a system are given below, followed by a brief description of the phase activities. Then the use of the specific manuals is described in greater detail.

- o Installation
- o Start-up
- o Sustaining

Phase Activities

During the **installation phase**, the system hardware is assembled and the 7411B software is configured for the application. The installation phase is completed when the system is functional. Fluke 7400 and A123 workstations are usually installed by Fluke. Fluke 7400 series calibration clusters and user configured systems are installed by the user. Optional, on-site training may also be provided by Fluke during the installation phase.

During the **startup phase**, the procedure writer and system operator become familiar with the behavior of the system (i.e. they "ascend the learning curve"). A large procedure writing and editing workload occurs in the start-up phase. The system's productivity increases as procedures come "on-line" and the operator's efficiency increases. The startup phase blends into the sustaining phase.

During the **sustaining phase**, the system routinely addresses the workload. New procedures are written as new instruments enter the workload. The sustaining phase may last for more than a decade.

USING THE MANUALS IN THE LIFE CYCLE

Configuration Manual

The Configuration Manual supports initial configuration and installation of the 7411B and the system in which it runs. It is used extensively during system installation but infrequently thereafter. The Configuration Manual is normally used by the procedure writer and system manager during the installation of any 7411B controlled system. A system engineer may use the Configuration Manual when a user configured system is being installed.

Introductory Training Manual

The Introductory Training Manual supports a self-paced and self-taught introduction to writing and editing calibration procedures with the 7411B. It is used extensively during the beginning of the start-up phase but rarely, if ever, thereafter.

The Introductory Training Manual may also be used during optional training provided by Fluke.

Procedure Writing Manual

The Procedure Writing Manual supports procedure writing. It is normally used by a procedure writer throughout the life cycle of the system. It is used most extensively during the installation and start-up phases of system operation and regularly but infrequently thereafter.

The last section of the Procedure Writing Manual contains information on how to update the Bar Code file, which contains the bar codes or property numbers of the instruments in inventory that are to be calibrated.

Operator Manual

The Operator Manual supports the day to day processing of calibration events at the system, and it supports event history management. It is extensively used by the system's operator during the start-up phase, but rarely, if ever, thereafter. It is also used extensively by the system manager or procedure writer during this phase, and either of these may consult the section on "Calibration History Management" from time to time throughout the life of the system.

5200A-800 Manual

The 5200A-800 Manual supports the accuracy enhancement of the Fluke Model 5200A AC Calibrator via a 540B-900 characterized Fluke Model 540B Thermal Transfer Standard. It is normally used extensively by a procedure writer during the start-up phase for systems that incorporate the 5200A but infrequently thereafter. It is not used when a system does not include a 5200A.

System Builder's Guide

The System Builder's Guide is a reference manual that supports the design of user configured clusters and workstations (i.e. non-7400-or-A123 series). It is normally used as a reference document by a system engineer during the design and debugging phases in the development of user configured clusters and workstations. It is not used to support any aspect of the configuration, installation or use of a Fluke 7400 or A123 series calibration workstation or cluster.

The System Builder's Guide provides a wealth of information on the analog aspects of systems such as grounding, guarding, shielding, thermal EMFs, leakage resistance, stray capacitance, conducted and transmitted EMI and other matters that are important to the successful integration of user designed and configured systems.

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7411B
CALIBRATION SOFTWARE

Introductory Training Manual

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Section 1
Introductory Procedure Writing Lessons

WELCOME TO 7411B PROCEDURE WRITING

This Introductory Training Manual, along with the 7411B Procedure Writing Manual, is the introduction to the world of procedure writing. Quality in the 7411B calibration procedures is the key to quality in instrument calibrations. A good knowledge of procedure writing will unleash the power of the 7411B Calibration Software, giving you the greatest flexibility in the procedure tests performed.

OBJECTIVE OF THIS MANUAL

The objectives of this Introductory Training Manual are to teach the student the basics of procedure writing, to give the student the tools necessary to write his own calibration procedures, and to show the student where he can find information on the details of procedure writing.

HOW TO USE THIS MANUAL

The 7411B Introductory Training Manual should be used in conjunction with the 7411B Procedure Writing Manual. This Training Manual gives a general introduction to procedure writing, descriptions of the most often used

Function Selection Codes, exercises dealing with these FSCs, and answers to the exercises. For detailed descriptions of specific points, reference will be made to the 7411B Procedure Writing Manual.

The following is a list of sections in this manual and what each section covers:

Section 1 Lessons

Contains an introduction to the manual, suggestions on where to look for information to get started writing procedures, and five procedure writing lessons.

Section 2 Exercises

Contains five procedure writing exercises which should be performed in turn after reading the associated lessons.

Section 3 Answers

Contains the answers to the associated exercises These answers should be viewed only after completing the exercises.

SYSTEM DOCUMENTATION

The 7411B is primarily supported by four major manuals in two volumes (binders). Volume 1 contains the Introductory Training Manual and the Procedure Writing Manual. Volume 2 contains the Operator Manual and Configuration Manual. In addition, Volume 2 contains two supplementary manuals: the 5200A-800 Manual and System Builder's Guide, both of which are used for reference purposes.

This is the Introductory Training Manual. The following paragraphs briefly describe the other major manuals in the 7411B Manual Set. Refer to Volume 1, How to Use These Manuals, for more information.

7411B Operator Manual

The 7411B Operator Manual describes how to operate a 7411B-driven computer-aided calibration system (referred to in this manual as a "Cluster", "Workstation" or "System"). It includes examples and a step-by-step tutorial describing how to use the 7411B to calibrate an instrument and handle data. This manual is intended for individuals who will operate the system.

7411B Procedure Writing Manual

The 7411B Procedure Writing Manual explains how to write or modify calibration procedures. The manual is intended for technicians or engineers who have a working knowledge of instrument calibration. However, writing and modifying procedures does not require programming experience.

7411B Configuration Manual

The 7411B Configuration Manual provides information for a system manager on how to configure a cluster or workstation and to make the 7411B compatible with the configuration.

Reference Documentation

The 7411B Operators Manual contains all the information necessary for normal operation of the 7411B system. For more detailed information about a specific instrument in the system, please refer to its

instruction manual. These manuals contain information required for troubleshooting and provide the sophisticated user with the detailed information necessary to meet unusual needs and requirements.

WHAT IS A PROCEDURE?

A procedure is a data file which defines the tests to be executed when calibrating an instrument. When you write a procedure you supply the system with this data file. The calibration tests entered into the calibration procedure are defined using a specialized "computer program," designed for the meter calibration environment. This is known as the 7411B Procedure Generator/Editor (PGE) software and is found on the 7411B diskette with the "Procedure Generator Editor" label. For additional information on calibration procedures, turn to pages 1-6 through 2-8 of the 7411B Procedure Writing Manual.

Procedure Format

Procedures are structured data files. All information in a procedure is placed according to a predefined format.

Procedures all begin with the same heading format. When a new procedure is created via PGE, this heading is automatically available for insertion of the necessary information. After the heading, each procedure has 10 columns (data fields). These data fields require different information for each function the system must perform. However, for most system functions require only up to three pieces of data.

Page 1-7 in the 7411B Procedure Writing Manual illustrates the heading and fields of a procedure.

Procedure Heading

As far as the heading goes, the only information the procedure writer needs to supply are the Instrument, Author, Revision, and Adjustment Threshold. The rest of the heading data is automatically updated.

Instrument, Author, and Revision are self explanatory. "Adjustment Threshold" is the point at which the operator may be directed to adjust the Unit Under Test (UUT). The default for the "Adjustment Threshold" is 70%. This means that if the magnitude of the error at a particular test point is less than 70% of the total allowable error, the operator will not be given the option to make an adjustment at that point. If the error at that point is 70% or more of the allowable tolerance, the operator will be able to adjust the Unit Under Test (UUT, sometimes referred to as TI for Test Instrument) if the procedure writer has placed an adjustment routine for the UUT into the calibration procedure.

The adjustment threshold for a single test point may be viewed in the following manner when the Adjustment Threshold = 70%

PERCENT ERROR	PASS/FAIL ADJ?
over 100%	FAIL with ADJ
70% to 100%	PASS with ADJ
0% to 69%	PASS with NO ADJ

Procedure Fields

Turn to page 1-13 through 1-20 in the 7411B Procedure Writing manual for a discussion of the fields. The Step number is incremented automatically by the system. The procedure writer selects the FSC (Function Select Code) and fills in the remaining data.

The data required by each FSC varies from FSC to FSC. If you ever have a question as to what information is required by a particular FSC, refer to the Procedure Writing Manual which contains thorough descriptions of each FSC.

HOW DO YOU WRITE A PROCEDURE?

Refer to the 7411B Procedure Writing Manual for detailed information on procedure writing. The steps necessary to write a new procedure depends if you use a Winchester Disk (for example, Fluke Model 1765B/20) or the floppy disk as a disk storage medium.

If you use a hard disk medium, the only thing you have to do to boot the system is to turn on the power to the controller and the hard disk. In the case of a floppy-disk configured system, you need insert the 7411B System Software Disk to boot the system.

Then:

1. Select in the 7411 System Directory the display key "EDIT PROCEDURE".

2. Note that a new menu appears.

3. Select "CREATE NEW".

4. Note that you can also create a new procedure from an old one (CREATE NEW FROM OLD) and modify an existing procedure (MODIFY PROCEDURE). Refer to the 7411B Procedure Writing Manual for more information on these options.

5. Write the procedure by making selections on the 1722A screen and adding data as needed.

6. Save the procedure. The procedure is saved on the hard disk if your system was configured as a hard disk system. Your procedure is saved on a floppy disk (you will be prompted to insert a formatted procedure disk) if your system was configured in this way.

PROCEDURE WRITING TUTORIAL

There is a procedure writing tutorial on page 2-1 of the 7411B Procedure Writing Manual. This tutorial provides an easy introduction to procedure writing. Step through this tutorial if you have not done so already. You may need a formatted procedure disk if you wish to save the Tutorial procedure you will be generating. For information on how to format a blank floppy, turn to the appropriate sections in the 1722A "System Guide" or in the 7411B Operator Manual. (You may also wish to review the 1722A Getting Started Guide.)

Lessons In Fundamental Procedure Writing

This section contains five procedure writing lessons along with five associated exercises. You should cover the material stated in this lesson plan, then do the associated exercise. The objective should be to get through all five exercises. The exercises are in Section 3. Do not look at the answers until you have finished each exercise.

Make sure you understand the answers, then go on to the next lesson.

LESSON ONE - AUTOMATIC MESSAGES AND YOUR FIRST FSC

The 7411B automatically inserts certain messages and requests certain information to aid the operator in performing the calibration. At the beginning of each calibration event, the 7411B will automatically request the operator to enter the UUT Serial Number and the UUT Code (typically a property number) unless the procedure is started by using a bar code entry, either by using a bar code reader or manual entry of a property number. If a property number is used, this entry of serial and property number is taken from the information that was contained in the bar code file. The operator will enter that information through the 1722A's touch sensitive display. This information will be stored for printout in the calibration results.

As the operator runs the calibration procedure, the system will notify him or her about which connections need to be made to the UUT. For example, if the procedure requires a voltage from the 5100B, the operator will be asked to connect the UUT to the 5100B output. This message will be automatically given to the operator before the stimulus is presented by the 5100B. This prevents connection to live ports on the 5100B.

All the instrument FSCs, i.e. 5100, 8506, 5205, 5220, 5440, 5001, etc. will generate automatic connection messages. When the connection is no longer needed, the operator will be instructed to change the connections.

The 7411B will also present range setting messages to the operator automatically. As the ranges need to be changed on the UUT, the operator will be notified.

All the following messages can be automatically generated by the system. The operator does not need to enter them into his procedure:

a) "Enter UUT Number"
b) "Enter UUT Code"
c) Connection messages
d) Range setting messages
e) Disconnection messages

FUNCTION SELECTION CODES

The FSCs indicate the function of the particular procedure line. Basically the FSCs fall into three groups:

a) Evaluation FSCs (produce a pass/fail result)
b) message oriented FSCs (present messages/instructions to the operator
c) Transparent FSCs (perform functions invisible to the operator)

See the 7411B Procedure Writing Manual for a thorough description of Function Selection Codes.

5100 FSC

In order to see the information available in the Procedure Writing Manual and to learn about an often used FSC, go over the 5100 FSC in detail. The manual gives a general description of each FSC. Then each FSC parameter is discussed, from "Range" through "Con".

Key facts to remember are:

RANGE — <range> must be followed by R. Do not enter the units of the test. The range will default to the Nominal units.

Tolerance: — The tolerance can be entered virtually the same way it is written in spec sheets. Entries include a floor value, a percent of reading value, a ppm of

reading value, a percent of range value and a ppm of range value and the system will compute the total tolerance for that test.

PROCEDURE WRITING EXERCISE 1

Turn to Exercise 1 at the start of Section 2 and follow the instructions. You will need to format a blank floppy disk to store the procedure you will be creating. Information on formatting is found in the "1722A System Guide". Basically, you must perform the following steps:

How to Format a Floppy Disk:

1. If your system was configured as a floppy-disk system, boot the 7411B System Software Disk. Remove it from the drive when instructed.
2. Enter CTRL T on the keyboard
3. Enter CTRL P.
4. Type FUP.
5. Place a blank floppy disk in the 1722A disk drive
6. Type mf0:/f2 (so that there is more than one directory on the disk.)

Proceed with Exercise 1 at this time. After you have saved the procedure on the blank disk, select "Calibrate an Instrument" from the main menu and run the procedure.

After running the procedure select "List Results on Screen" and view the results.

LESSON TWO - VERIFICATION PROCEDURES

Basically there are two types of tests that can be performed with an automated calibration system. These are:

1) Verification
2) Calibration

The system performs verification tests by presenting a stimulus to the UUT, allowing the operator to slew the stimulus until the UUT is reading appropriately, then calculating the amount of error in the instrument. In this manner the system "verifies" that the UUT is within specifications.

The procedure you wrote in Exercise 1 was a verification procedure even though it only tested one point.

HEAD FSC

Verification procedures will contain series of tests for DC Voltage, AC Voltage, and Resistance, for example. Each section should have a HEADing indicating the types of tests to be run.

Review the HEAD FSC in the 7411B Procedure Writing Manual. The HEADing is a one line title which will stay at the top of the 1722A screen through out the calibration tests until changed.

If you want the HEADing printed in the results, you should place the HEADing in braces { }. Any information in braces will be directly printed in the results.

5100 FSC (FOR AC)

If the tests you are performing call for AC, you will

use the 5100 FSC just as you did for DC tests. Merely add the frequency of the test while writing the procedure. Frequency should be followed by an "H".

RESF FSC

The 5100B contains fixed resistors from 1 ohm to 10 Megohms. These resistor values are called using the RESF FSC. You must remember a range and tolerance along with the resistance value when using RESF in verification evaluations.

Procedure Writing Exercise 2

Exercise 2 builds upon Exercise 1. Take the 1 line procedure from Exercise 1 and modify it into this Exercise 2 Procedure and again save it on your blank disk.

LESSON THREE - CALIBRATION PROCEDURES WITH ADJUSTMENTS

True calibration procedures contain the necessary steps to see if each test point is in cal or not and, if not, contain the necessary commands to bring the UUT into cal.

Adjustment Routines

Normally in your procedure you will perform a verification test to determine the degree of error in the UUT. If the percent of tolerance error is beyond the "adjustment threshold", the operator will be able to go into an adjustment routine. The adjustment routine will allow the operator to adjust the UUT and bring it back into spec.

Adjustment routines can easily be seen when viewing the listing of a procedure because they are indented. In the 8040A procedure listing on page 1-7 of the 7411B Procedure Writing Manual, there is an adjustment routine beginning on line 24.003.

A standard adjustment routine will have a stimulus presented (setup) by the calibrator. This stimulus will be held constant while instructions are presented telling the operator which adjustments to make to bring the UUT into spec. Then the routine will have the operator JuMP back to the initial verification check to determine whether the UUT is now within spec.

The approach in writing adjustment routines is summarized as follows:

1. Setup stimulus from the calibrator.
2. have a DISP and a DRAW which tells the operator which potentiometer to adjust.
3. JuMP back to the initial evaluation.

Calibration Procedure Format

Each calibration procedure should begin with the following format:

a) First DRAW a picture of the meter for future reference in showing the locations of settings and adjustment controls.
b) Make a HEADing to indicate the type of tests being conducted.
c) Then have your instrument tests with adjustment procedures according to the instrument manual calibration procedure. Additional instructions can be given to the operator using the DISplay FSC.

DRAW FSC

Each procedure you write should begin with the DRAW Function Selection Code. The DRAW FSC will tell the system the shape of the meter for future references in locating adjustment pots or setting controls.

Select the DRAW FSC at the start of the procedure, then shape the meter using the touch sensitive keys on the 1722A screen.

Later in the procedure when you want to show the location of an adjustable control, for example, simply type in [DRAW,,L] if the pot is on the right side of the instrument, [DRAW,,R] if the pot is on the right side of the instrument, T for top, B for back, F for front. The system will then present to you a graphic locator with which to show the exact location of the pot on that side of the UUT.

DISP FSC

The DISP FSC shows a one-time display message to the operator with the [ADV] advance key to step past the

display. While the Head FSC will remain until it is changed, the DISplay will disappear when the operator presses ADV.

DISP is used to give the operator special calibration instructions.

JMP FSC

The JMP FSC allows an unconditional jump to another point in the procedure. In adjustment procedures, a JMP is used to return to the initial verification evaluation to see if the UUT is in cal after the adjustment routine.

You also have JMPT and JMPF and JMPZ FSC's which allow different portions of a procedure to be performed depending upon the outcome of tests or depending upon the intentions of the operator.

Adjustment Procedure Example

A typical adjustment procedure might look like this:

```
STEP  FSC    RANGE  NOMINAL TOLERANCE MOD1 MOD2 3  2  4  CON

1.001 DRAW          8 78 8 78             67 5 33 50
1.002 HEAD          {DC VOLTAGE CALIBRATION}
1.003 5100   200    190mV   .6U                          2W
1.004        5100   190mV                             S  2W
1.005        DISP   {ADJUST POT R6} FOR 190mV.[DRAWO,25,L]
1.006        JMP    1.003
```

Procedure Writing Exercise 3

Do exercise 3. Build upon Exercise 1 and 2, modifying the procedure into the Exercise 3 procedure.

LESSON FOUR - "FAST" PROCEDURES

You can make your procedures "faster" by manipulating the automatic messages which the system normally presents. An experienced operator may not need to see every connection message. He may not need every range setting message. This lesson teaches you how to control these messages.

ASK+, ASK-, FSCs

The ASK+ and ASK- FSCs allow the procedure writer to control these automatic messages. For example, to turn off the automatic range message, the procedure writer would select "ASK- W."

Go through the description of ASK+ and ASK- in the Procedure Writing Manual.

OPBR FSC

The OPerator BRanch FSC will ask the operator a question and enable a JuMP to another part of the procedure depending on the response of the operator.

The OPerator BRanch FSC will place a 1 in a memory register [MEM1] if the operator answers YES to a question. OPBR will place a -1 in [MEM1] if the operator answers NO to that question.

JMPF, JMPT FSCs

JMPF <line number will make procedure execution go to that line number if the operator answers NO. JMPF will not have any effect if the operator had answered YES.

JMPT <line number> will make procedure execution go to that line number if the operator answers yes. JMPT will not have any effect if the operator had answered NO.

PROCEDURE WRITING EXERCISE 4

Do Exercise 4 at this time. Again build on the procedure you have been working on.

LESSON FIVE - MEM MANIPULATION

This lesson teaches you manipulation of data using the MEMory registers.

[MEM] AND [MEM1]

The 7411B provides two "on-line" memory registers, MEM and MEM1 which you may use to manipulate data. Evaluation and "Nomset" tests (see discussion of MOD 4 in the 5100 FSC description) place the final value of the test in MEM. Setups like those used in adjustment routines place their values in MEM1.

The 7411B also provide 20 "off-line" memory registers which are accessed by the MEME FSC for storing and retrieving data during the execution of a procedure.

MEMI FSC

Various FSCs allow you to utilize these memory registers. MEMI will present the operator with an instruction, then allow the operator to enter a value into the MEM register via the touch sensitive screen.

MEM*, MEM/, MEM+, AND MEM-

These FSCs allow the manipulation of the value in [MEM] using a constant entered with the FSC or the contents of MEM1.

The procedure writer can enter a value which he wants to multiply by, divide by, add to, or subtract from the value in [MEM]. Examples:

```
STEP  FSC   RANGE   NOMINAL   TOLERANCE   MOD1   MOD2   3   4   CON

      MEM*          10
            results in: [MEM] = [MEM] * 10
```

```
MEM/          10
      results in: [MEM] = [MEM] / 10
MEM+          10
      results in: [MEM] = [MEM] + 10
MEM-          10
      results in: [MEM] = [MEM] - 10
```

Similarly, the value in [MEM1] is used by not specifying a constant in the FSC. Examples:

```
STEP  FSC  RANGE  NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON

MEM*
      results in: [MEM] = [MEM] * [MEM1]
MEM/
      results in: [MEM] = [MEM] / [MEM1]
MEM+
      results in: [MEM] = [MEM] + [MEM1]
MEM-
      results in: [MEM] = [MEM] - [MEM1]
```

RSLT FSC

The ReSuLT FSC allows the entry of data directly into the results. Any statements or data after an = sign will be placed directly into the results.

If you want the value in MEM placed in the results, merely enclose MEM in brackets [MEM] and the value in MEM will be printed.

Go over the description of the RSLT FSC in the Procedure Writing Manual.

Procedure Writing Exercise 5

At this time turn to Exercise 5, again building upon your procedure.

CONGRATULATIONS

Exercise 5 was the last of the procedure exercises. Performing these five exercises will have given you a good basis for generating procedures with a sound knowledge of the most important FSCs.

To augment your training in procedure writing, turn to Section 4 of the Procedure Writing Manual and study the descriptions of the FSCs which were not covered in these exercises. As practice, try adding steps requiring these FSCs to the procedure you have been generating.

Training in procedure writing is also available from Fluke. Contact your local Fluke Sales or Service office for more information.

7411B PROCEDURE WRITING EXERCISE 1

Write a procedure which performs the following:

1. Allows to operator to enter the UUT serial number into the results,

2. Allows the operator to enter a "UUT Code" into the results,

3. Tells the operator to make the proper connections to the TI Panel,

4. Tells the operator to set the UUT to the proper range, and

5. Tells the operator to remove the TI Panel connections when he or she is done.

This procedure should also perform one verification test. That test should tell the operator to set the UUT to the 2 volt range, elicit 1.9 volts DC from the 5100B Calibrator, and test to a tolerance of .006 volt.

After you have written the procedure, press the "Backup" display key on the 1722A to save it. If your system was configured as a floppy-disk based system you will be prompted to insert our blank procedure diskette; the hard disk based system will save it on the Winchester disk.

7411B PROCEDURE WRITING EXERCISE 2

Continuing with the procedure you began in Exercise 1, write a procedure which contains verification tests for all the test points listed below. You should have separate HEADings for DC Voltage, AC Voltage, and Resistance tests.

When you are through writing this verification procedure, save it on your blank disk.

DC VOLTAGE CALIBRATION

RANGE	INPUT VOLTAGE	TOLERANCE	CALIBRATION COMPONENT
200mV	190mV	.6mV	R6
200mV	-190mV	.6mV	None
2V	1.9V	.006V	None
20V	19V	.06V	None
200V	190V	.6V	None
1000V	1000V	3V	None

AC VOLTAGE CALIBRATION

RANGE	INPUT VOLTAGE	INPUT FREQUENCY	TOLERANCE	CALIBRATION COMPONENT
200mV	190mV	100Hz	1.6mV	R4
2V	1.9V	100Hz	.016V	None
20V	19V	100Hz	.16V	None
200V	190V	100Hz	1.6V	None
1000V	750V	400Hz	9V	None

RESISTANCE CALIBRATION

RANGE	INPUT RESISTANCE	TOLERANCE	CALIBRATION COMPONENT
200 ohms	10 ohms	.9 ohm	None
2 Kohms	1.0 Kohm	.005 Kohm	None
20 Kohms	10 Kohms	.05 Kohm	None
200 Kohms	100 Kohms	.5 Kohm	None
2 Mohms	1.0 Mohm	.005 Mohm	None
20 Mohms	10 Mohms	.2 Mohm	None

7411B PROCEDURE WRITING EXERCISE 3

Make your Verification Procedure from Exercise 2 into a Calibration Procedure.

If you look at the specifications listed for Exercise 2 you will see there are two Calibration Components listed. These are R6 for the 190 mV DC Voltage test and R4 for the 190 mV AC Voltage test.

Add R6 and R4 adjustment routines to the verification procedure you wrote in Exercise 2. These adjustment routines should contain graphic displays showing the locations of R6 and R4 along with the appropriate instructions to the operator.

The front of the meter looks like this:

Both pots are located on the left side of the UUT:

When you are through modifying the Exercise 2 Verification Procedure into this Exercise 3 Calibration Procedure, save it on your blank disk. Then boot your Instrument Calibration Disk and run the procedure to see how the DRAWings are displayed.

7411B PROCEDURE WRITING EXERCISE 4

Using the skills you have learned, continue improving the procedure you have been creating. Allow the operator to decide whether he wants:

1) all automatic messages,

2) no range messages, or

3) no connection messages.

Add this feature to your procedure, then run the procedure and note the changes in the automatic messages.

Remember when you delete certain automatic messages, the operator must know the UUT well enough to calibrate the instrument without the automatic instructions.

7411B PROCEDURE WRITING EXERCISE 5

This exercise focuses on use of the MEM register to manipulate data and perform calculations.

This addition to your procedure is for a cal lab which wants the lab temperature printed in the results in degrees Celsius. The cal lab, however, has a thermometer which only reads degrees Fahrenheit.

Have the operator enter the lab temperature in degrees Fahrenheit. Then in the procedure convert degrees Fahrenheit to degrees Celsius using the calculating capability you have with the MEM register.

Remember the formula for converting degrees Fahrenheit to degrees Celsius?

$$TC = (TF - 32) * 5/9$$

Finally, have the temperature given in degrees Celsius printed in the results.

Save this procedure on your disk and try it out. Run through a few tests, then terminate the procedure and look at the results.

Section 3
Introductory Training Answers

```
JOHN FLUKE MFG. CO., INC.                                        7411B PROCEDURE

================================================================================

INSTRUMENT:              PROCEDURE WRITING EXERCISE 1

DATE:                    23-Feb-87
AUTHOR:                  DDG
REVISION:                0

ADJUSTMENT THRESHOLD:    70%

NUMBER OF TESTS:         1
NUMBER OF LINES:         22
CONFIGURATION:           Fluke 5100B

================================================================================

 STEP     FSC     RANGE NOMINAL        TOLERANCE      MOD1        MOD2  3  4  CON

  1.001  5100    2     1.9V           .006U                                   2W
END
```

JOHN FLUKE MFG. CO., INC. 7411B PROCEDURE

==========

INSTRUMENT: PROCEDURE WRITING EXERCISE 2

DATE: 24-Feb-87
AUTHOR: DDG
REVISION: 1.0

ADJUSTMENT THRESHOLD: 70%

NUMBER OF TESTS: 17
NUMBER OF LINES: 40
CONFIGURATION: Fluke 5100B

==========

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	HEAD		{DC VOLTAGE CALIBRATION}						
1.002	5100	200	190mV	.6U					2W
2.001	5100	-200	190mV	.6U					2W
3.001	5100	2	1.9V	.006U					2W
4.001	5100	20	19V	.06U					2W
5.001	5100	200	190V	.6U					2W
6.001	5100	1000	1000V	3U					2W
7.001	HEAD		{AC VOLTAGE CALIBRATION}						
7.002	5100	200	190mV	1.6U	100H				2W
8.001	5100	2	1.9V	.016U	100H				2W
9.001	5100	20	19V	.16U	100H				2W
10.001	5100	200	190V	1.6U	100H				2W
11.001	5100	1000	750V	9U	400H				2W
12.001	RESF	200	100Z	.9U					2W
13.001	RESF	2	1KZ	.005U					2W
14.001	RESF	20	10KZ	.05U					2W
15.001	RESF	200	100KZ	.5U					2W
16.001	RESF	2	1MZ	.005U					2W
17.001	RESF	20	10MZ	.2U					2W

END

```
JOHN FLUKE MFG. CO., INC.                                        7411B PROCEDURE
================================================================================

INSTRUMENT:              PROCEDURE WRITING EXERCISE 3

DATE:                    24-Feb-87
AUTHOR:                  DDG
REVISION:                1.0

ADJUSTMENT THRESHOLD:    70%

NUMBER OF TESTS:         17
NUMBER OF LINES:         47
CONFIGURATION:           Fluke 5100B

================================================================================

 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4  CON

  1.001  DRAW          8 78  8 78                  67  5 33 50
  1.002  HEAD          {DC VOLTAGE CALIBRATION}
  1.003  5100   200     190mV          .6U                                   2W
  1.004         5100    190mV                                             S  2W
  1.005         DISP    {ADJUST POT R6} FOR A READING OF 190mV.[DRAW,25,L]
  1.006         JMP     1.003
  2.001  5100   -200     190mV          .6U                                   2W
  3.001  5100   2        1.9V           .006U                                 2W
  4.001  5100   20       19V            .06U                                  2W
  5.001  5100   200      190V           .6U                                   2W
  6.001  5100   1000     1000V          3U                                    2W
  7.001  HEAD          {AC VOLTAGE CALIBRATION}
  7.002  5100   200      190mV          1.6U          100H                    2W
  7.003         5100    190mV                        100H                 S  2W
  7.004         DISP    {ADJUST POT R4} FOR A READING OF 190mV.[DRAW33,70,L]
  7.005         JMP     7.002
  8.001  5100   2        1.9V           .016U         100H                    2W
  9.001  5100   20       19V            .16U          100H                    2W
 10.001  5100   200      190V           1.6U          100H                    2W
 11.001  5100   1000     750V           9U            400H                    2W
 12.001  RESF   200      100Z           .9U                                   2W
 13.001  RESF   2        1KZ            .005U                                 2W
 14.001  RESF   20       10KZ           .05U                                  2W
 15.001  RESF   200      100KZ          .5U                                   2W
 16.001  RESF   2        1MZ            .005U                                 2W
 17.001  RESF   20       10MZ           .2U                                   2W
END
```

```
JOHN FLUKE MFG. CO., INC.                                          7411B PROCEDURE
================================================================================

INSTRUMENT:             PROCEDURE WRITING EXERCISE 4

DATE:                   24-Feb-87
AUTHOR:                 DDG
REVISION:               1.0

ADJUSTMENT THRESHOLD:   70%

NUMBER OF TESTS:        17
NUMBER OF LINES:        59
CONFIGURATION:          Fluke 5100B

================================================================================

 STEP    FSC     RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4  CON

  1.001  DRAW           8 78  8 78                   67  5 33 50
  1.002  DISP          THIS PROCEDURE IS ADAPTABLE TO VARYING OPERATOR SKILL
  1.002  DISP          LEVELS. IF THE METER YOU ARE CALIBRATING IS FAMILIAR TO
  1.002  DISP          YOU, THE AUTOMATIC RANGE AND CONNECTION MESSAGES MAY BE
  1.002  DISP          DELETED BY ANSWERING THE FOLLOWING QUESTIONS
  1.002  DISP          APPROPRIATELY.
  1.003  OPBR          WOULD YOU LIKE TO TURN OFF AUTOMATIC RANGE MESSAGES?
  1.004  JMPF          1.006
  1.005  ASK-   R
  1.006  OPBR          WOULD YOU LIKE TO TURN OFF AUTOMATIC CONNECTION
  1.006  OPBR          MESSAGES?
  1.007  JMPF          1.009
  1.008  ASK-                                                                  W
  1.009  HEAD          {DC VOLTAGE CALIBRATION}
  1.010  5100   200    190mV          .6U                                     2W
  1.011         5100   190mV                                               S  2W
  1.012         DISP   {ADJUST POT R6} FOR A READING OF 190mV.[DRAW,25,L]
  1.013         JMP    1.010
  2.001  5100   -200   190mV          .6U                                     2W
  3.001  5100   2      1.9V           .006U                                   2W
  4.001  5100   20     19V            .06U                                    2W
  5.001  5100   200    190V           .6U                                     2W
  6.001  5100   1000   1000V          3U                                      2W
  7.001  HEAD          {AC VOLTAGE CALIBRATION}
  7.002  5100   200    190mV          1.6U          100H                      2W
  7.003         5100   190mV                        100H                  S   2W
  7.004         DISP   {ADJUST POT R4} FOR A READING OF 190mV.[DRAW33,70,L]
  7.005         JMP    7.002
  8.001  5100   2      1.9V           .016U         100H                      2W
  9.001  5100   20     19V            .16U          100H                      2W
 10.001  5100   200    190V           1.6U          100H                      2W
 11.001  5100   1000   750V           9U            400H                      2W
 12.001  RESF   200    100Z           .9U                                     2W
 13.001  RESF   2      1KZ            .005U                                   2W
 14.001  RESF   20     10KZ           .05U                                    2W
 15.001  RESF   200    100KZ          .5U                                     2W
 16.001  RESF   2      1MZ            .005U                                   2W
 17.001  RESF   20     10MZ           .2U                                     2W
END
```

JOHN FLUKE MFG. CO., INC. 7411B PROCEDURE

==========

INSTRUMENT: PROCEDURE WRITING EXERCISE 5

DATE: 24-Feb-87
AUTHOR: DDG
REVISION: 1.0

ADJUSTMENT THRESHOLD: 70%

NUMBER OF TESTS: 17
NUMBER OF LINES: 64
CONFIGURATION: Fluke 5100B

==========

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	DRAW		8 78 8 78		67 5 33 50				
1.002	DISP		THIS PROCEDURE IS ADAPTABLE TO VARYING OPERATOR SKILL						
1.002	DISP		LEVELS. IF THE METER YOU ARE CALIBRATING IS FAMILIAR TO						
1.002	DISP		YOU, THE AUTOMATIC RANGE AND CONNECTION MESSAGES MAY BE						
1.002	DISP		DELETED BY ANSWERING THE FOLLOWING QUESTIONS						
1.002	DISP		APPROPRIATELY.						
1.003	OPBR		WOULD YOU LIKE TO TURN OFF AUTOMATIC RANGE MESSAGES?						
1.004	JMPF		1.006						
1.005	ASK-	R							
1.006	OPBR		WOULD YOU LIKE TO TURN OFF AUTOMATIC CONNECTION						
1.006	OPBR		MESSAGES?						
1.007	JMPF		1.009						
1.008	ASK-								W
1.009	MEMI		ENTER THE LAB TEMPERATURE IN DEGREES FAHRENHEIT.						
1.010	MEM-		32						
1.011	MEM*		5						
1.012	MEM/		9						
1.013	RSLT		=LAB TEMPERATURE IS [MEM] DEGREES CELSIUS.						
1.014	HEAD		{DC VOLTAGE CALIBRATION}						
1.015	5100	200	190mV	.6U					2W
1.016		5100	190mV					S	2W
1.017		DISP	{ADJUST POT R6} FOR A READING OF 190mV.[DRAW,25,L]						
1.018		JMP	1.015						
2.001	5100	-200	190mV	.6U					2W
3.001	5100	2	1.9V	.006U					2W
4.001	5100	20	19V	.06U					2W
5.001	5100	200	190V	.6U					2W
6.001	5100	1000	1000V	3U					2W
7.001	HEAD		{AC VOLTAGE CALIBRATION}						
7.002	5100	200	190mV	1.6U	100H				2W
7.003		5100	190mV		100H			S	2W
7.004		DISP	{ADJUST POT R4} FOR A READING OF 190mV.[DRAW33,70,L]						
7.005		JMP	7.002						
8.001	5100	2	1.9V	.016U	100H				2W

```
  9.001  5100   20     19V          .16U          100H                2W
 10.001  5100   200    190V         1.6U          100H                2W
 11.001  5100   1000   750V         9U            400H                2W
 12.001  RESF   200    100Z         .9U                               2W
 13.001  RESF   2      1KZ          .005U                             2W
 14.001  RESF   20     10KZ         .05U                              2W
 15.001  RESF   200    100KZ        .5U                               2W
 16.001  RESF   2      1MZ          .005U                             2W
 17.001  RESF   20     10MZ         .2U                               2W
END
```

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CHANGE/ERRATA INFORMATION

ISSUE NO: 3 9/87

This change/errata contains information necessary to ensure the accuracy of the following manual:

MANUAL

Title:	7411B Procedure Writing Manual
Print Date:	March 1987
Rev.- Date:	---

Add the following warning prior to page 1-1:

WARNING

Calibration of many instruments requires that dangerous voltages are generated or measured by the 7411B calibration system. It is essential that the operator and procedure writer be very aware of possible hazards that could occur. To avoid electric shock and fire hazards, follow the instructions listed below.

1. Use appropriate interconnect wiring and adaptors, which are rated for the possible voltage and current levels carried.

2. Under no circumstances should exposed conductive signal portions of interconnect wiring and connectors be touched, even after instruments have been turned off.

3. Always disconnect the interconnect wiring first at the source and then at the measurement side touching only insulated portions of the connectors.

4. Always use insulated adjustment tools.

5. If the RESTART or ABORT button at the front panel of the 1722A controller is used during the execution of a procedure in order to gain program control, the operator must verify that no dangerous voltages remain present. Specifically he should verify that the front panels of signal sources show instruments in the standby mode, and the UUT does not produce dangerous voltages.

6. The Procedure Writer should minimize the time during which dangerous voltages are applied. Refer to the safety check listing in table 3-1 of the 7411B Procedure Writing Manual.

Replace the paragraph on page 2-4:

The next phase of procedure writing is to create the procedure body. This is where the specific instrument tests are accomplished using FSCs (Function Selection Codes) and the data is entered in the FSC information fields.

NOTE

If one screen is not sufficient to contain all available FSC selection buttons, a "MORE" option is displayed at the lower left portion of the screen. Pressing this button will display other FSC selection buttons not shown on the current screen.

The keyboard can also be used to select the FSC. This is accomplished by typing the FSC name and pressing RETURN. In this case any FSC application can be selected without displaying it on the 1722A.

Often, a number is displayed below the selection button on the screen. Typing this number has the same effect as touching the 1722A display.

Specific instrument tests are prefaced with headings. After the heading is inserted, the proper FSC (for the required stimulus output) is selected, and the information fields are completed. This process is repeated (with several options) until the parameters of the UUT have been entered.

On page 5-9, change the fourth paragraph,

FROM: The frequency/amplitude restrictions as stated in the nominal value section apply to MOD1 must be greater than or equal to 100 kHz.

TO: The frequency/amplitude restrictions as stated in the nominal value section apply to MOD1 as well.

On page 5-10, under MOD3, change the table as follows:

ENTRY	OUTPUT SPECIFIED
SI	Sine Wave output specified
TI	Triangle Wave output specified
SQ	Square Wave output specified
SC	Square Wave output 180 degrees out of phase with SYNC out

On page 5-11, at the top of the page,

CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-17, in the table under the first paragraph,

DELETE: 1000H under MOD2

ADD: 1000H under MOD1

On page 5-21, in the table, under entry "C"

CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-26, in the paragraph labeled Allowed Values:
CHANGE: Frequency: up to 125 MHz (but not 0 H)
TO: Frequency: > OH and < 125 MHz (endpoints not included)

Add to the end of the sentences starting with Ratio, Period, and Difference:
(endpoints not included)

On page 5-29, change the second table as follows:

a.	100mV to 50V
b.	-6.98D to 46.98D @ 50 ohms
c.	-8.75D to 45.22D @ 75 ohms
d.	-14.77D to 39.21D @ 300 ohms
e.	-17.78D to 36.19D @ 600 ohms

On page 5-31, in the table, entry "C"
CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

In the paragraph labeled TEST TYPE, replace the first paragraph as follows:

Evaluation test. The operator is asked to set the UUT to output the Nominal value for this test. The system makes the measurement and records the result in MEM1.

On page 5-37, the second table, under the heading CURRENT,
CHANGE: 1 mA- 100mA, peak
TO: 1,2,3,4,5,6,8,10,12,15,16,20,25,30,40,50,60,80 and 100mA peak

Under the heading VOLTAGE,
CHANGE: 40 uVP -60mVP
TO: 40 uVP -80mVP

At the bottom of page 5-37, add the following paragraph:

FAST EDGE
Fast Edge Mode is selected when the entry for the amplitude is +1.1VP or -1.1VP. Fast Edge Mode is also selected automatically if just nominal units are entered and the value stored in MEM is +1.1VP +/-9.9% .

On page 5-38, under SLEWED EDGE,

CHANGE: .4nT, .5nT-10nT in in 1, 2, 5, sequence (may also be specified in H)

TO: .4nT, .5nT-10nT in 1, 2, 5, sequence (may also be specified In H)

In the last paragraph, make the following change:

For VOLTAGE amplitude specification, the ...

On page 5-43, at the top of the page,

CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-47, add the following paragraph:

> Normally the CG5001 can only be programmed at the allowed nominal values. Using the slew function, a maximum deviation of 9.9% from this nominal value can be achieved. It is possible to program the CG5001 directly with a deviated value by assigning the desired value to MEM and then providing only the units in the 5001 FSC, so that the nominal value in MEM is taken. The 5001 cannot be programmed directly through the NOMINAL field in this manner.

On page 5-50, under Volts, ac add the following:
110v to 500v @ 50Hz to 1kHz (7405A system only)

On page 5-53 in the table labeled Units and Multiplier,

CHANGE:	m or M	10^6
TO:	M	10^6
	m	10^{-3}

On page 5-54 add the following sentence to the end of the first paragraph:

> Insert the letter 'O' to select the divider override feature.

Under MOD3, the second sentence,
CHANGE: volts
TO: volts

Before the last paragraph, add the following:

> Another mode of accuracy enhancement can be specified during the Setup procedure steps only when the enhancement is accomplished with the 8506A voltmeter. This mode is not created automatically. In a Setup mode it is possible to enhance the accuracy directly, by changing the output of the 5100B depending on the reading on the 8506A. This is the normal type of Accuracy Enhancement, which is accomplished with the simple 'E' flag.

On page 5-55, under NOMINAL VOLTAGE,

CHANGE:
```
> 0.02 V
> 0.02 V
```

TO:
```
>=0.02 V
>=0.02 V
```

Change the first paragraph to read:

> Automatic insertion is prevented by entering -E during specifying the calibration step. The -E will remain in the procedure listing to show that Accuracy Enhancement was not desired.
>
> See MISCELLANEOUS for more information.

On page 5-58, Change all occurrences

FROM: 7411A

TO: 7411B

On page 5-68, in the table, entry "C"

CHANGE:
```
Contains value
used for UUT
INDICATED
```

TO: Unchanged

Add to the bottom of page 5-70:

Use of the 5205A or 5215A with the 5200A. The 5200 FSC presumes the use of the 5215A in the system, since only AC operation is of interest. If a 5205A is actually used, it should be configured in as a 5215A during the configuration phase of the system.

On page 5-75 in the table labeled Units and Multiplier,

CHANGE:	m or M	10^6
TO:	M	10^6
	m	10^{-3}

Add to the bottom of page 5-77:

Use of the 5205A or 5215A with the 5100B. The 5205 FSC presumes the use of the 5205A driven by the 5100B in the system. The 5205A is assumed, since both DC and AC voltages can be generated with the 5100B.

If the 5215A is actually used, it should be configured in as a 5205A during the configuration phase of the system. The 5205 FSC should be used, with the frequency specified (no DC voltages), to drive the 5215A.

On page 5-79, in the table, change the following:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.009	5220		1.9A	3%					2W

On page 5-80, add the following prior to ALLOWED PREFIXES

NOTE

The user can slew down to 1A, if necessary.

On page 5-83 in the table labeled Units and Multiplier,

CHANGE:	m or M	10^6
TO:	M	10^6
	m	10^{-3}

Add to the bottom of page 5-85.

Use of the 5220A with the 5100B or 5440B. The 5220 FSC presumes the use of the 5220A driven by the 5100B in the system. It is also possible to use the 5220A with the 5440B. In the latter case use the 5440 FSC. However, if both the 5100B and 5440B are in the system, the software assumes that the 5220A is always connected to the 5100B and the 5220 FSC must be used to obtain current from its output.

On page 5-91, in the table, entry "C":

CHANGE:	Contains value used for UUT INDICATED
TO:	Unchanged

Add to the bottom of page 5-93/94:

Use of the 5220A with the 5440B

The 5220A is normally connected to the 5100B. It is possible however, if there is no 5100B in the system to drive the 5220A using the 5440B. You may configure the 5220A in during the configuration phase of the system and use the 5440 FSC to program currents from the output of the 5220A. If no 5220A is connected to the 5440B while executing the procedure, an error message will result.

Pages 5-248, 5-249 and 5-250 are not associated with the MCAL FSC; in reality they deal with an optional use of the MEME FSC. These three pages describe the use of 20 additional registers, and storing and retrieving data in and from these registers. Page 5-248 should become blank, and replace pages 5-249, 5-250, and 5-251 with the following text:

MEME
Transparent FSC

DESCRIPTION

The MEME FSC stores a number in memory register MEM, exchanges the contents of MEM with the contents of MEM1, stores the contents of MEM in one of 20 additional registers, or retrieves the contents in one of those 20 memory locations and stores the data in MEM. Examples of the MEME FSC are shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
4.002	MEME		-10.71						
4.003	MEME								
4.004	MEME					>1			
4.005	MEME					<20			

PARAMETERS

The NOMINAL field is used only when a number is to be stored in MEM. The MOD2 field is only used to transfer data between one of the 20 additional registers and MEM. No entries in any of the fields causes an exchange of the contents of registers MEM and MEM1.

NOMINAL

Specifies the number to be stored in the MEM memory register. If Nominal is left blank, the contents of MEM1 is exchanged with the contents of MEM. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal number, or be blank.

MOD2

The MOD2 field is used to identify the direction of the data flow and the register among 20 available to be used. MOD2 consists of the '>' or '<' sign, followed by an integer from 1 up to and including 20 (>nn or <nn, with 1 <= nn <= 20).

The data flow is from MEM to the memory location identified by the number following the > sign. The contents of MEM is not affected. For example the contents of MEM overwrites the current content of the additional memory register #1 with the following program step:

```
4.004  MEME                              >1
```

The data flow is from the memory location identified by the number following the < sign. The contents of the identified memory location is not affected, while the current contents of MEM is overwritten. The following program step might be used to copy the contents of additional memory register #20 into MEM:

```
4.005  MEME                              <20
```

Notes:

The values of the additional memory registers are set to zero when the calibration procedure is selected.

The present value of MEM1 is not affected by the use of a '1' in either the >nn or <nn operation.

The procedure writer can use the MEMI FSC to prompt the operator to enter a numeric value into MEM. Then he uses the MEME FSC to move the value in MEM to a register for later use. During the execution of the procedure, the operator is prompted to enter the numeric value into MEM via the Touch Sensitive Overlay (TSO) on the screen of the 1722A. The MEME FSC causes the value to be copied to one or more specified memory locations. Later in the procedure the data is retrieved again through MEM and used for the required purpose.

Example:
The operator may be given 10 sequential prompts to enter the values of 10 standard cells into MEM via the TSO of the 1722A. The MEME FSC's following every MEMI FSC will load these 10 values in 10 memory locations. Later, the DISP, MEME, MEM+ and 5440 FSC's are used to prompt the operator to sequentially connect the cells in series, obtain a running total of these values and use this running total to test the accuracy of a Fluke 5440B on its 10V range.

On page 5-99, in the table, entry "C"

CHANGE:	Contains value used for UUT INDICATED
TO:	Unchanged

On page 5-104, replace ALLOWED VALUES with the following:

The allowed nominal values are:

-55.01D to +26.98D	with 50 ohms termination
0.3972V to 5V	with 50 ohms termination
1.1235 VP to 14.14 VP	with 50 ohms termination
0.7944 mV to 10V	without 50 ohms termination
2.247 mVP to 28.28 VP	without 50 ohms termination
10H to 10.99999 MHz	

On page 5-107, prior to MOD2 add the following:

o If just units are provided in the MOD1 field, the MOD1 field shall assume the value of MEM. This option is used for bandwidth testing of oscilloscopes.

Example:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	ASK-	D	N			F			W
1.002	DISP		Connect the 6011 to the input of channel A, 20 div						
1.002	DISP		Adjust the amplitude for 6 divisions						
1.003	6011		120 mVP		100 kHz	-D		N	
1.004	MESS		Adjust the frequency for an amplitude of 4.2 div						
1.005	6011		5 MHz	+50%	mVP	-D			

Explanation:

Turn off the regular message lines and connection messages. Give the operator specific instructions for setting up the UUT. Complete a nominal setting of the 6011, which stores the last value after slewing in MEM. Provide a message to the operator which stays on during the adjustment. Next slew the frequency with the amplitude set at MEM until the 3 dB point (0.7 * 6 divisions) is obtained. The tolerance indicates that the bandwidth cannot be less than 5 MHz (important), and no greater than 7.5 MHz (not important).

On page 5-108, in table, entry "C":

CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-110, replace the paragraph titled CON (connection) as follows:

Connection. Specifies the load into which the 6011A output is calibrated.

- o No entry: no termination (high impedance load) is assumed.
- o 'L': the 6011A is calibrated into a 50-ohm load.

NOTE

'L' influences the range of valid AMPLITUDE entries both in the NOMINAL field and MOD1 field.

'L' will be automatically specified if the amplitude is expressed in units of D.

On page 5-114, replace ALLOWED VALUES as follows:

The allowed nominal values for the Fluke 6060 FSC are:

-127D to +13D	from 10 kHz to 2100 MHz
0.1 uV to 1V	from 10 kHz to 2100 MHz
0.283 uVP to +2.82 VP	from 10 kHz to 2100 MHz

10 kHz to 1050 MHz	from -127D to +13D
10 kHz to 1050 MHz	from 0.1 uV to 1V
10 kHz to 1050 MHz	from 0.283 uVP to 2.82 VP

This FSC drives the 6060A, 6060B, 6061A, and 6062A. There are some capability differences between these instruments. The procedure writer must be aware of these differences. If a capability is not present in the instrument that is actually in the system, an error message may occur at run time.

Limitations for the 6060A:

-127D to +13D	from 100 kHz to 1050 MHz
0.1 uV to 1V	from 100 kHz to 1050 MHz
0.283 uVP to 2.82 VP	from 100 kHz to 1050 MHz

100 kHz to 1050 MHz	from -127D to +13D
100 kHz to 1050 MHz	from 0.1 uV to 1V
100 kHz to 1050 MHz	from 0.283 uVP to 2.82 VP

Limitations for the 6060B and 6061A:

-127D to +13D	from 10 kHz to 1050 MHz
0.1 uV to 1V	from 10 kHz to 1050 MHz
0.283 uVP to 2.82 VP	from 10 kHz to 1050 MHz

10 kHz to 1050 MHz	from -127D to +13D
10 kHz to 1050 MHz	from 0.1 uV to 1V
10 kHz to 1050 MHz	from 0.283 uVP to 2.82 VP

Limitations for the 6062A:

-127D to +13D	from 100 kHz to 2100 MHz
0.1 uV to 1V	from 100 kHz to 2100 MHz
0.283 uVP to 2.82 VP	from 100 kHz to 2100 MHz

100 kHz to 1050 MHz	from -127D to +13D
100 kHz to 1050 MHz	from 0.1 uV to 1V
100 kHz to 1050 MHz	from 0.283 uVP to 2.82 VP

NOTE

The Pulse Modulation capability of the 6062A is not supported in 7411B calibration software.

On page 5-117, add the following to the end of the page:

- If just units are provided in the MOD1 field, the value the MOD1 field shall assume is MEM. This option is used for bandwidth testing of oscilloscopes.

Example:

```
STEP   FSC    RANGE NOMINAL TOLERANCE MOD1 MOD2 3 4 CON
1.001  ASK-   D     N                       F        W
1.002  DISP         Connect the 6060 to the input of channel A,20 mV
1.002  DISP         Adjust the amplitude for 6 divisions
1.003  606           120 mVP              100 kHz -D       N
1.004  MESS         Adjust the frequency for an amplitude of 4.2 div
1.005  6060          5 MHz  +50%        mVP   -D
```

Explanation:

Turn off the regular message lines and connection messages. Give the operator specific instructions for setting up the UUT. Complete a nominal setting for the 6060, which stores the last value after slewing in MEM. Provide a message to the operator, which stays on during the following adjustment. Next slew the frequency with the amplitude set at MEM until the 3 dB point (0.7 * 6 divisions) is obtained. The tolerance indicates that the bandwidth cannot be less than 50 MHz (important), and no greater than 75 MHz (not important).

On page 5-119, change entry "C" as follows:

FROM: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-120, under CON add the following:

Any 'L' entry in this field is disregarded.

On page 5-121, change the second sentence in the second paragraph to read:

A range message is not produced for a Setup test if the range is simply R.

On page 5-124, replace the paragraph labeled ALLOWED VALUES with the following:

The allowed nominal values are:

-139.9D to +19D	from 200 kHz to 519.999999 MHz
0.022 uV to 2V	from 200 kHz to 519.999999 MHz
0.0623 uVP to 5.65 VP	from 200 kHz to 519.999999 MHz
-139.9D to +13D	from 520 MHz to 1039.99998 MHz
0.022 uV to 1V	from 520 MHz to 1039.99998 MHz
0.0623 uVP to 2.82 VP	from 200 kHz to 519.999999 MHz

200 kHz to 519.999999 MHz	from -139.9D to +19D
200 kHz to 519.999999 MHz	from 0.022 uV to 2V
200 kHz to 519.999999 MHz	from 0.0623 uVP to 5.65 VP
520 MHz to 1039.999998 MHz	from -139.9D to +19D
520 MHz to 1039.999998 MHz	from 0.022 uV to 1V
520 MHz to 1039.999998 MHz	from 0.0623 uVP to 2.82 VP

On page 5-128, prior to MOD2, add the following:

- If just units are provided in the MOD1 field, the value the MOD1 field shall assume is in MEM. This option is used for bandwidth testing of oscilloscopes.

Example:

```
STEP  FSC  RANGE NOMINAL TOLERANCE MOD1 MOD2 3 4 CON
1.001 ASK- D     N                        F       W
1.002 DISP      Connect the 6071 to the input of channel A, 20 mV/div
1.002 DISP      Adjust the amplitude for 6 divisions
1.003 6071       120 mVP          100 kHz -D     N
1.004 MESS      Adjust the frequency for an amplitude of 4.2 div
1.005 6071       50 MHz  +50%      mVP    -D
```

Explanation:
Turn off the regular message lines and connection messages. Give the operator specific instructions for setting up the UUT. Complete a nominal setting of the 6071, which stores the last value after slewing the MEM. Provide a message to the operator which stays on during adjustment. Next slew the frequency with the amplitude set at MEM until the 3 dB point (0.7 * 6 divisions) is obtained. The tolerance indicates that the bandwidth cannot be less than 50 MHz (important), and no greater than 75 MHz (not important).

On page 5-130, under CON (Connection), add the following:
Any 'L' entry in this field is disregarded.

On page 5-138, under E Accuracy Enhancement make the following changes:

FROM: o Nominal greater than 0.2V
TO: o Nominal greater than or equal to 0.2V

FROM: o Frequency greater than 50 Hz and less than 10 kHz
TO: o Frequency greater than or equal to 50 Hz and less than or equal to 10 kHz

On page 5-139, change the last paragraph to read:
Nominal Set test. The Nominal Set test acts just as a normal test except, the result is not evaluated, and it is stored in...

On page 5-140, under CON replace the paragraph as follows:

Connection. The procedure generator editor will always add 'L' if not already specified. The HIGH FREQ output is always calibrated for a 50-ohm load; the MOD output is calibrated for a 600-ohm load.

On page 5-144, under Decibels make the following changes:

-30.08D to 68.57D @ 50 ohms
-31.84D to 66.81D @ 75 ohms
-37.86D to 60.79D @ 300 ohms
-40.87D to 57.78D @ 600 ohms

In the table under ALLOWED PREFIXES,

CHANGE: mV or MV mA or MA mY or MY mD or MD 10^{-3}
TO: mV or MV mA or MA mZ mY or MY mD or MD 10^{-3}

CHANGE: mV or MV mA or MA mZ or MZ mY or MY mD or MD 10^{6}
TO: mV or MV mA or MA MZ mY or MY mD or MD 10^{6}

On page 5-147 in the table labeled Units and Multiplier,

CHANGE: m or M 10^{6}
TO: M 10^{6}
m 10^{-3}

On page 5-148, under the heading MOD3, in the table labeled Entry, Function, Result.

DELETE: VAC Volts ac function selected, "ENH'D ACC" mode enabled, ac coupling enabled.

In the last paragraph under the Result column,

CHANGE: ...ACC" mode enabled, ac coupling enabled.
TO: ...ACC" mode enabled, ac + dc coupling enabled.

On page 5-149, change the third paragraph as follows:

G VAC Volts ac function selected, "NORMAL MODE" enabled, ac coupling enabled.

On page 5-150, in the paragraph headed Miscellaneous:

CHANGE: Only the rms ac converter is supported.

TO: In VAC the rms converter is normally used. If using the averaging converter, the F flag must be used.

On page 5-157, in the table labeled Units and Multiplier,

CHANGE:	m or M	10^6
TO:	M	10^6
	m	10^{-3}

On page 5-190, under MOD4, entry "C"

CHANGE: Contains value used for UUT INDICATED

TO: Unchanged

On page 5-207, replace the third paragraph as follows:

[I$]

The special construction [I$] performs an input from the specified address. This function is similar to the BASIC statement INPUT LINE @ <address>, <variable>. The input is an alphanumeric string, and it overwrites the contents of MEM2.

On page 5-208, add the following to the end of the page:

The IEEE address of the UUT may not be specified in the IEEE FSC. If left unspecified, at execution time of the procedure, the operator will be prompted for the UUT IEEE address. The 7411B software will verify that the address provided by the operator is not in conflict with any configured instruments in the system or is an illegal address.

After the IEEE address has been specified once, the same address will be used in following IEEE FSC without IEEE address specification.

On page 5-221, the second sentence:

CHANGE: If MEM1 does not equal 1, the next procedure...
TO: If MEM1 does not equal 0, the next procedure...

On page 5-229, replace the first paragraph as follows:

The MEM* FSC allows you to multiply the contents of MEM by the value specified in Nominal, or it multiplies the contents of MEM by the value contained in MEM1. The product of either method is placed in MEM. [MEM] = [MEM] * Nominal or if Nominal field is blank: [MEM] = [MEM] * [MEM1] An example of MEM* FSC is shown below:

On page 5-231, replace the first paragraph as follows:

The MEM/ FSC allows you to divide the value of MEM by a certain number (specified in Nominal) or divide the value of MEM by the value in MEM1. The quotient of either method is placed in MEM. [MEM] = [MEM] / Nominal or if Nominal field is blank: [MEM] = [MEM] / [MEM1]. An example of the MEM/ FSC is shown below:

On page 5-233, replace the first paragraph as follows:

> If Nominal is left blank, the value of MEM1 is added to the value of MEM. The sum of either method is placed in MEM. [MEM] = [MEM] + Nominal or if Nominal field is blank: [MEM] = [MEM] + [MEM1]. An example of the MEM+ FSC is shown below:

On page 5-235, replace the first paragraph as follows:

> If Nominal is left blank, the value of MEM1 is subtracted from the value in MEM. The difference of either method is placed in MEM. [MEM] = [MEM] - Nominal or if Nominal field is blank: [MEM] = [MEM] - [MEM] An example of the MEM- FSC is shown below:

On page 5-238, the last equation,
CHANGE: [MEM2] VOLTS/DIV
TO: [MEM] VOLTS/DIV

On page 5-239, in the paragraph labeled, Memory Allocation,
CHANGE: If the operator does not enter a value, the contents of MEM2 will be 0 (zero).

TO: If the operator does not enter a value, the contents of MEM2 will be blank.

On page 5-241, replace the table under ALLOWED UNITS with the following:

VOLTS:	V or Volts
AMPS:	A or Amps
DECIBELS:	D or Decibels
DEGREES (Temp)	Degrees C or Degrees F
RESISTANCE	Z or Ohms
CONDUCTANCE	Y or Siemens
FREQUENCY	H
PERIOD	T

On page 5-242, replace the first sentence and the table with the following:

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value per the following rules and modifies the (lower or upper) case as follows:

All upper case prefixes P, N, and U will be modified to lower case, independent of the UNITS (V,A, etc).

All lower case prefixes K and G will be modified to upper case, independent of the UNITS.

A upper case prefix 'M' will be changed to upper case for all units, except H (Hertz) and Z (Ohms).

The MULTIPLIERS are:

p:	1E-12	n:	1E-9	u:	1E-6
m:	1E-3	K:	1E+3	G:	1E+9

M: 1E-3(UNITS not H or Z)
M: 1E+6(UNITS H or Z)

On page 5-262 in the table labeled Entered and Assigned:

CHANGE:	m	M 10^{6} (if H or HS)
	m or M	m 10^{-3} (if not H or HS)
	M	M 10^{6} (if H or HS)
TO:	m	m 10^{-3}
	M	m 10^{-3} (if not H or HS)
	M	M 10^{6} (if H or HS)

In the table labeled AM MODULATION:

CHANGE:	0.2 to 5	20H to 8 kHz	<=90
	5 to 520	20H to 50 kHz	<=90
	520 to 1040	20H to 50 kHz	<=70
TO:	0.2 to 5	20H to 8 kHz	<=89.9%
	5 to 520	20H to 50 kHz	<=89.9%
	520 to 1040	20H to 50 kHz	<=69.9%

On page 5-264 in the table labeled Entered and Assigned:

CHANGE:	m	M 10^6 (if H or HS)
	m or M	m 10^{-3} (if not H or HS)
	M	M 10^6 (if H or HS)
TO:	m	m 10^{-3}
	M	m 10^{-3} (if not H or HS)
	M	M 10^6 (if H or HS)

On page 5-266 the last sentence in the last paragraph should read:

> Because of this, the programmer should be cognizant of the parameters being used when this FSC is selected.

On page 5-273, replace the first sentence as follows:

> The PORT FSC performs a transfer of data through the RS232 port of the 1722A.

On page 5-281, under TEST TYPE replace the first paragraph as follows:

> (blank) Normal pass/fail test. The operator slews the system CRT display until it equals the reading on the unit under test, and an evaluation based on the final CRT reading is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display.

On page 5-313,

CHANGE: [DRAW--,--,-)
TO: [DRAW--,--,-]

On page 5-321 in the table labeled Units and Multiplier

CHANGE:	m or M	10^6
TO:	M	10^6
	m	10^{-3}

On page -viii-, change every occurence:
FROM: 7411A
TO: 7411B

On page -ix-, change every occurence:
FROM: 7411A
TO: 7411B

7411B
CALIBRATION SOFTWARE

Procedure Writing Manual

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Section 1
Introduction

WELCOME TO 7411B PROCEDURE WRITING

Congratulations on your purchase of the 7411B. The 7411B software package is the result of an intensive software development program, developed by metrologists for the metrology environment. The 7411B opens the world of automated calibration to you, providing increased productivity and greater confidence in your calibrations.

The quality and efficiency of your calibrations with the 7411B are directly related to the quality of your calibration procedures. This manual is intended to aid you in your efforts to develop and refine your calibration procedures.

NOTE:

A summary of the differences between the 7411A and 7411B Calibration Software is in Section 1 on the 7411B Configuration Manual.

WHERE TO START

This manual and the 7411B Introductory Training Manual both contain information about procedure writing. For a thorough introduction to procedure writing, you should

read the first three sections of this manual, then do the exercises in the Introductory Training Manual. In the Introductory Training Manual you will find FSC descriptions, exercises dealing with FSCs, and answers to the exercises. Use the Introductory Training Manual to develop or enhance your procedure writing skills.

HOW TO USE THIS MANUAL

The 7411B Procedure Writing Manual is the third volume in the 7411B Manual Set. (The 7411B Configuration Manual is the first, and the 7411B Operator Manual is the second.) This manual is intended for those responsible for defining the calibration procedures in your metrology lab. The 7411B software was developed with the idea that procedure writers need not be computer programmers. The 7411B Procedure Writing Manual (this manual), the 7411B Introductory Training Manual, and a little patience should be all that is required to learn how to write procedures.

The following is a list of the sections in this manual and what each section covers:

Section 1 Introduction

Contains general information for the procedure writer, an overview of the System software and how it works, an overview of this manual's contents, and an overall description of procedure writing.

Section 2 Procedure Writing Tutorial

Contains a walk-through of the procedure writing process. This section describes an example calibration procedure and explains what takes place during the procedure writing process.

Section 3 Using the Edit a Procedure Option

Contains information on how to use the Edit a Procedure option. This option is used to create a new calibration procedure, to modify an already existing procedure, or to create a new procedure from an already existing procedure.

Section 4 FSC Descriptions

Contains reference pages on the uses and applications of FSCs (Function Selection Codes). These pages are arranged in alphanumeric order for easy reference.

SYSTEM DOCUMENTATION

The 7411B is primarily supported by four major manuals in two volumes (binders). Volume 1 contains the Introductory Training Manual and the Procedure Writing Manual. Volume 2 contains the Operator Manual and Configuration Manual. In addition, Volume 2 contains two supplementary manuals: the 5200A-800 Manual and System Builder's Guide, both of which are used for reference purposes. Volume 1 also contains a supplementary manual, How To Use These Manuals.

This is the Procedure Writing Manual. The following paragraphs briefly describe the other major manuals in the 7411B Manual Set. Refer to Volume1, How to Use These Manuals, for more information.

7411B Configuration Manual

The 7411B Configuration Manual describes both the hardware configuration and the software configuration. It can be used to help develop hardware systems and software procedures for specific calibration applications.

7411B Operator Manual

The 7411B Operator Manual describes how to operate the 7411B Calibration Software (referred to in this manual as the 7411B). It includes examples and a step-by-step tutorial describing how to use the 7411B to calibrate an instrument and handle data. This manual is intended for individuals who will operate the system.

7411B Introductory Training Manual

If you have little or no background in procedure writing, the 7411B Introductory Training Manual is a good place to improve your skills. In the 7411B Introductory Training Manual you will find FSC descriptions, exercises dealing with FSCs, and answers to the exercises. Use the 7411B Introductory Training Manual in conjunction with the 7411B Procedure Writing Manual to develop or enhance your procedure-writing skills.

Reference Documentation

The 7411B Operator Manual contains all the information necessary for normal operation of the 7411B. For more detailed information about a specific instrument in the System, please refer to one of the manuals for that specific instrument. These manuals contain information required for troubleshooting and provide the sophisticated user with the detailed information necessary to meet unusual needs and requirements.

WHAT IS A CALIBRATION PROCEDURE?

A calibration procedure is a table of test definitions to be performed on an instrument in order to calibrate it. (The instrument being calibrated is usually referred to as the Unit Under Test or UUT.) The

calibration tests, entered into the calibration procedure, are defined using a specialized "computer language" that has been designed for the meter calibration environment.

A calibration procedure may contain several subprocedures that are automatically initiated to accomplish a specific task. Each subprocedure is actually a calibration procedure, written like the main procedure. Both types of procedures may contain up to 300 lines.

A calibration procedure may be written solely to verify the performance of the UUT, or a procedure can require that the operator make the necessary calibration adjustments on the UUT to bring it within specifications. Adjustments during calibration procedures may be designated as optional (the adjustment is made if the operator believes it is required) or mandatory (an adjustment must be made for the test to continue).

Calibration procedures are stored on floppy disks or the hard disk drive and may be written expressly for one UUT or for several (up to six) instruments. Once a procedure is written for a UUT (or several similar UUTs) and stored on disk, it can be loaded from the disk and used for that UUT at any time.

HOW DO YOU WRITE A CALIBRATION PROCEDURE?

The 7411B Procedure Generator software is designed for interactive generation or modification of calibration procedures. The Procedure Generator checks the syntax (format) of each entry made and the semantics (correctness) whenever possible. The use of default values speeds up the procedure writing process. If the procedure writer does not enter certain values, the

system will automatically enter the default values. Automatic additions of default values are clearly marked by underlines when the data is displayed.

Calibration procedures are executable as soon as they are written. The 7411B software checks to verify that entries are executable by the system and within system hardware capabilities. However, it is possible to enter tolerances that exceed the capabilities of the system hardware. Also, the 7411B Software is not able to verify that tolerances, nominal values, and adjustments are correct for the specific UUT.

DETAILED DESCRIPTION OF A PROCEDURE

The following paragraphs describe the example calibration procedure shown in Figure 1-1.

This procedure was written for the Fluke 7405A Automated Calibration System (part of the 7400 Series). The structure and contents of this procedure are identical to a procedure written and generated for a 7400/A123 system with the following exceptions:

- The RESV FSC (Function Select Code) is used only in a 7405A system.
- The 8502 FSC would be replaced by an 8505 or 8506 FSC for all 7400/A123 systems obtained after 1983.

Procedure Header

The procedure is prefaced by a header. The first line in the header identifies John Fluke Mfg. Co., Inc. as the system manufacturer, and the file type as a 7411B Procedure (7405A in the example shown). The headings of the Procedure Header are described under each heading title in the following paragraphs.

INSTRUMENT:

This heading contains the name of the instrument for which the procedure was written. Up to six instruments can be specified in each procedure. If more than one instrument is specified, the line header (INSTRUMENT:) will be repeated before each instrument name. The procedure writer must enter the name of the instrument at the time the procedure is written or modified. A colon in the instrument name line (e.g., FLUKE 8040A: CALIBRATION PROCEDURE) separates the data on the left as part of Cal History Management Option data.

DATE:

This heading shows the calendar date that the procedure was written or last edited. The system enters this information automatically.

AUTHOR:

This heading gives the name of the person (and/or facility) who wrote and/or last edited the procedure. The use of this heading is optional.

REVISION:

This heading shows the revision level of the procedure. The heading is automatically entered as 0 when the procedure is first written. You should increment this value each time you modify or update the procedure. This process helps to identify the status of the procedure. The use of this heading is optional.

```
JOHN FLUKE MFG. CO., INC.                                    7411B PROCEDURE
================================================================================

INSTRUMENT:             FLUKE 8040A: CALIBRATION PROCEDURE

DATE:                   24-Feb-87
AUTHOR:                 MICHAEL THIEMANN\CRAIG SMITH
REVISION:               V1.0.0 SCD9084

ADJUSTMENT THRESHOLD:   70 %

NUMBER OF TESTS:        78
NUMBER OF LINES:        299
CONFIGURATION:          Fluke 5100B                 Fluke 5205A
                        Fluke 8502A/05A             Fluke 7405 TI Panel
                        Fluke 1953A
================================================================================

 STEP    FSC    RANGE NOMINAL       TOLERANCE     MOD1        MOD2  3  4  CON

  1.001  SET           Range/Function: *
  1.002  HEAD          {DC VOLTAGE PERFORMANCE CHECK}
  1.003  RUN           FEPP1
  1.004  DISP          CONNECT TEST LEAD TO 8040A VOLT-OHM AND COMMON TERMINALS
  1.005  DISP          TURN 8040A ON
  1.006  5100   200    190mV         .13U                                  2W
  2.001  5100   2      1.9V          .0012U                                2W
  3.001  5100   2      .9V           .0007U                                2W
  4.001  5100   20     19V           .012U                                 2W
  5.001  5100   20     9V            .007U                                 2W
  6.001  5100   200    190V          .12U                                  2W
  7.001  5100   200    50V           .05U                                  2W
  8.001  5205   1100   1000V         .7U                             E     2W
  9.001  5100   1100   450V          .4U                                   2W
 10.001  HEAD          {AC VOLTAGE PERFORMANCE TESTS}
 10.002  5100   200    190mV         2U            50H                     2W
 11.001  5100   200    190mV         1.05U         5KH                     2W
 12.001  5100   200    190mV         2U            20KH                    2W
 13.001  5100   2      1.9V          .02U          50H                     2W
 14.001  5100   2      .9V           .01U          10KH                    2W
 15.001  5100   2      1.9V          .02U          20KH                    2W
 16.001  5100   20     19V           .2U           50H                     2W
 17.001  5100   20     8V            .05U          5KH                     2W
 18.001  5100   20     19V           .2U           20KH                    2W
 19.001  5100   200    190V          2U            50H                     2W
 20.001  5205   200    190V          2U            20KH                    2W
 21.001  5205   750    750V          3.5U          50H                     2W
 22.001  5205   750    750V          3.5U          10KH                    2W
 23.001  HEAD          {RESISTANCE PERFORMANCE CHECK}
 23.002  ASK-                                                  A
 23.003  DISP          {CONNECT A SHORT} BETWEEN 8040A V-OHM AND COMMON TERM.
 23.004  RNG           KZ
 23.005  EVAL  {DOES THE 8040A DISPLAY READ 00.00 TO 00.03?}
 24.001  DISP          DISCONNECT SHORT
 24.002  RESF   2000   1000KZ        2.3U                                  2W
 24.003         RESP   1MZ                                             S   2W
 24.004         DISP   ADJUST {R47} FOR A UUT DISPLAY OF 1000.0
 24.005         JMP    24.002
 25.001  RNG           Z
 25.002  DISP          Place a SHORT on test leads at TI Panel end.
 25.003  MEMI          ENTER THE READING FROM THE 8040A.
 25.004  DISP          {REMOVE SHORT}
 25.005  MEME
 25.006  RESF   200    100Z          .23U                              E  N  2W
 25.007  MEM+
 25.008  MEMC   200    100Z          .23U
 25.009         ASK-   N                           M               A  L  T  W
 25.010         CON    18
 25.011         DISP   Connect MFO Source to MFI Sense
 25.012         RESP   100Z                                             S  2W
```

Figure 1-1. Example Procedure

```
25.013          8502  100Z          1U                                  N  2W
25.014          CON   2
25.015          DISP  V-Ohm and COMMON terminals.
25.016          DISP  ADJUST (R10) FOR AN 8040A DISPLAY OF (MEM)
25.017          RNG   Z
25.018          RESF  1MZ                                                 S  2W
25.019          DISP  ADJUST (R47) FOR AN 8040A DISPLAY OF 1000.0
25.020          RESF  100Z                                                S  2W
25.021          DISP  ADJUST (R10) FOR AN 8040A DISPLAY OF (MEM)
25.022          ASK-  N                          M              A  L  T  W
25.023          RNG   200Z
25.024          JMP   25.002
26.001  RESF    2     1KZ            .0023U                               N  2W
26.002  MEME
26.003  MEM/          1000
26.004  MEME
26.005  MEM+
26.006  MEMC          1KZ            .0023U
27.001  RESV  20      5KZ            .013U                                N  2W
27.002  MEM+
27.003  MEMC          5KZ            .013U
28.001  RESF  20      10KZ           .023U                                N  2W
28.002  MEM+
28.003  MEMC          10KZ           .023U
29.001  RESF  200     100KZ          .23U                                    2W
30.001  RESV  2000    500KZ          1.3U                                    2W
31.001  RESF  A       10MZ           .053U                                   2W
32.001  RUN           FEPP2
32.002  JMPT          42.004
32.003  HEAD          (DC CURRENT PERFORMANCE CHECK)
32.004  DISP          CONNECT TEST LEADS TO 8040A mA AND COMMON INPUTS
32.005  ASK+                                                    A
32.006  5100  200     190uA          .6U                                     2W
33.001  5100  2       1.9mA          .006U                                   2W
34.001  5100  20      19mA           .06U                                    2W
35.001  5100  200     190mA          .6U                                     2W
36.001  5100  2000    1900mA         6U                                      2W
37.001  HEAD
37.002  OPBR          DID THE 8040A FAIL ANY OF THE PERFORMANCE CHECKS?
37.003  JMPF          78.003
37.004  DISP          YOU ARE NOW ENTERING THE (CALIBRATION PROCEDURE)
37.005  OPBR          WOULD YOU LIKE TO PERFORM INITIAL CAL. CHECK PROCEDURE
37.006  JMPF          39.002
37.007  HEAD          (INITIAL CALIBRATION CHECK PROCEDURE)
37.008  DISP          REMOVE UUT CASE AND MAIN PCB (see 8040A manual)
37.009  ASK-  R       N                          M                        W
37.010  CON           16
37.011  DISP          Connect Multifunction Input HI to C11 and Multifunction
37.011  DISP          Input Low to COMMON on the Analog Converter PCB.
37.012  8502  A       11.5V          .7U                                     2W
38.001  CON           256
38.002  DISP          Connect test leads to Frequency Input, Port A
38.003  DISP          Connect test leads to U25 pin 6 on the Digital
38.003  DISP          Conditioner PCB
38.004  1953  A       1MH            .00025U      2V                         A
39.001  DISP          FOLD MAIN PCB (follow procedure in 8040A manual)
39.002  HEAD          (DC VOLTAGE CALIBRATION)
39.003  ASK-  R       N                          M                        W
39.004  CON           0
39.005  DISP          Disconnect Test Cables from Test Interface Panel
39.006  RNG           200mV
39.007  EVAL  (DOES THE 8040A DISPLAY READ 00.00 +/- .75?)
40.001  DISP          Connect a short to the V-Ohm and COMMON input terminals
40.002  EVAL  (DOES THE 8040A DISPLAY READ 00.00 +/- 0.01?)
41.001  DISP          REMOVE THE SHORT
41.002  HEAD          (OHMS CALIBRATION)
41.003  RNG           2mA
41.004  MESS          Connect Multifunction Input HI to TP1 and Multifunction
41.004  MESS          Input LO to the 8040A COMMON terminal
41.004  MESS
41.004  MESS          (ADJUST R42) FOR A 1722A DISPLAY READING OF 0+/-mV DC
```

Figure 1-1. Example Procedure (cont)

```
41.005  8502        0.0mV                                                S  2W
41.006  MESS
41.007  DISP        Remove test leads from 8040A
41.008  DISP        Select UUT Range/Function k-ohms AUTO range
41.009  DISP        Short the 8040A COMMON and V-OHM terminals
41.010  EVAL   DOES THE {8040A DISPLAY READ 00.00 OR 00.01?}
42.001  ASK+   R    N                          M              A        W
42.002  RUN         FEPP3
42.003  JMP         24.001
42.004  HEAD        {VAC MIDBAND CALIBRATION}
42.005  CON         0
42.006  RNG         2mA
42.007  ASK-   R    N                          M                       W
42.008  CON         16
42.009  DISP        Connect Multifunction Input HI to TP1 and Multifunction
42.009  DISP        Input LO to COMMON input terminal on 8040A
42.010  8502   A    0.0mV          1U                                    2W
43.001  MESS        Connect Multifunction Input Sense HI to TP2
43.001  MESS        {ADJUST R66 (AC ZERO)} FOR A READING OF 0 +/-70mV
43.002  8502        0mV                                                  S  2W
43.003  CON         18
43.004  DISP        Connect Multifunction Output Source LO and GUARD to
43.004  DISP        8040A COMMON terminal
43.005  DISP        Connect Multifunction Output Source HI to 8040A mA INPUT
43.006  5100        100mV                                                S  2W
43.007  MEMI        ENTER 8040A DISPLAY READING:
43.008  5100        -100mV                                               S  2W
43.009  DISP        {ADJUST R86 (SYMMETRY)} FOR A UUT DISPLAY OF {MEM}
43.010  OPBR        DID YOU HAVE TO ADJUST R86?
43.011  JMPT        43.006
43.012  5100        *                                                    S
43.013  SET         Range/Function: *2V AC
43.014  DISP        Connect a short to 8040A V-OHM and COMMON terminals
43.015  DISP        {Rotate R100 (100mV AC)} fully clockwise, then slowly
43.015  DISP        counterclockwise until the 8040A display value is
43.015  DISP        reduced to 150 +/-30 digits.
43.016  DISP        {Rotate R88} clockwise until the UUT Display changes
43.016  DISP        by 1 or 2 digits.
43.017  DISP        REMOVE THE SHORT FROM THE 8040A
43.018  MESS        Connect MULTIFUNCTION INPUT SENSE HI to TP2 and
43.018  MESS        MULTIFUNCTION INPUT SENSE LO to 8040A COMMON
43.018  MESS
43.018  MESS
43.018  MESS        {ADJUST R66 (AC ZERO)} FOR A READING OF 0 +/-70mV
43.019  8502        0mV                                                  S  2W
43.020  MESS
43.021  CON         2
43.022  DISP        Connect Multifunction Output Source LO and GUARD to
43.022  DISP        8040A COMMON terminal.
43.023  DISP        Connect Multifunction Output Source HI to V-OHM terminal
43.024  5100        1V                         200H                      S  2W
43.025  MEMI        ENTER UUT DISPLAY READING:
43.026  5100        .1V                        200H                      S  2W
43.027  MEM/        10
43.028  DISP        {ADJUST R100 (100mV AC)} FOR UUT DISPLAY OF {MEM}
43.029  OPBR        DID YOU HAVE TO ADJUST R100?
43.030  JMPT        43.204
43.031  5100        1V                         200H                      S  2W
43.032  DISP        {ADJUST R101 (1.0V AC)} FOR A UUT DISPLAY OF 1.0000
43.033  HEAD        {VAC MIDBAND CALIBRATION VERIFICATION}
43.034  ASK+   R    N                          M                         W
43.035  5100   200  100mV          .6U         200H                      2W
44.001  5100   2    1V             .006U       200H                      2W
45.001  5100   200  10mV           .15U        200H                      2W
46.001  5100   A    10mV           .15U        200H                      2W
47.001  5100   A    100mV          .6U         200H                      2W
48.001  ASK-   R
48.002  5100   A    1V             .006U       200H                      2W
49.001  5100   A    10V            .06U        200H                      2W
```

Figure 1-1. Example Procedure (cont)

```
50.001  5100   A     100V          .6U          200H                  2W
51.001  5205   A     750V          4.8U         200H                  2W
52.001  HEAD         {DC VOLTAGE CALIBRATION TESTS}
52.002  RNG          2V
52.003  5100         -1.9V                                        E  S  2W
52.004  DISP         {ADJUST R31} FOR UUT DISPLAY OF {MEM1}
52.005  5100         1.9V                                         E  S  2W
52.006  DISP         {ADJUST R38} FOR UUT DISPLAY OF {MEM1}
52.007  5100   2     0V            .0002U                             2W
53.001  5100   2     -1.9V         .0012U                             2W
54.001  5100   2     1.8V          .0011U                             2W
55.001  ASK+   M
55.002  5100   200   190mV         .01U                         E     2W
55.003         5100  190mV                                      E  S  2W
55.004         DISP  ADJUST {R60} FOR UUT DISPLAY OF {MEM1}
55.005         JMP   55.002
56.001  MEME
56.002  5100   200   -190mV        .01U                         E     2W
56.003         5100  -190mV                                     E  S  2W
56.004         DISP  ADJUST {R60} FOR UUT DISPLAY OF {MEM1}
56.005         JMP   55.002
57.001  MEM+
57.002  MEMC   200   0V            0.01U
57.003         DISP  THE TOLERANCE FOR THE 190mV AND -190mV TESTS MUST BE
57.003         DISP  THE SAME, THE CALIBRATION ROUTINE MUST NOW BE REPEATED
57.004         JMP   55.002
58.001  RNG          V
58.002  5100         190V                                            S  2W
58.003  DISP         {ADJUST R9} FOR UUT DISPLAY OF 190.00
58.004  ASK-   R
58.005  5100   A     1.9V          .0012U                             2W
59.001  5100   A     19V           .012U                              2W
60.001  EVAL   DID THE {8040A AUTORANGE} AFTER THE LAST TEST{?}
61.001  5205         1000V                                        E  S  2W
61.002  DISP         {ADJUST R3} FOR UUT DISPLAY OF {MEM1}
61.003  5205         *                                               S
61.004  DISP         REMOVE TEST CABLE AND CONNECT A SHORT, WATCH FOR AUTO-
61.004  DISP         RANGING.
61.005  EVAL   DID THE {8040A AUTORANGE DOWN?}
62.001  DISP         DISCONNECT SHORT AND RE-CONNECT TEST LEADS TO V-OHM AND
62.001  DISP         COMMON INPUT TERMINALS
62.002  5205   A     -1000V        .7U                          E     2W
63.001  HEAD         {VAC FREQUENCY RESPONSE CALIBRATION}
63.002  ASK+   R
63.003  5205   750   500V          .3U          10KH                  2W
63.004         5205  500V                       10KH                S 2W
63.005         DISP  ADJUST {C3} FOR UUT DISPLAY OF 499.7 TO 500.3
63.005         DISP  IF C3 LACKS THE ADJUSTMENT RANGE TO BRING THE UUT
63.005         DISP  DISPLAY TO THE CORRECT VALUE THEN ROTATE C3 TO THE
63.005         DISP  CENTER OF TRAVEL, ADJUST C24 UNTIL DISPLAY IS AS CLOSE
63.005         DISP  AS POSSIBLE TO 500.0 AND THEN RE-ADJUST C3.
63.006         JMP   63.003
64.001  5100   200   100V          .04U         10KH            E     2W
64.002         5100  100V                       10KH            E  S  2W
64.003         DISP  ADJUST {C2} FOR 8040A DISPLAY OF {MEM1}
64.004         RPT
64.005         RPT
65.001  HEAD         {VAC CALIBRATION VERIFICATION}
```

Figure 1-1. Example Procedure (cont)

```
 65.002  5100   A     100mV          1U             20KH                    2W
 66.001  ASK-   R
 66.002  5100   A     1V             .011U          20KH                    2W
 67.001  5100   A     10V            .11U           20KH                    2W
 68.001  5100   A     100V           1.1U           20KH                    2W
 69.001  5205   A     500V           6U             20KH                    2W
 70.001  5205   A     500V           3.5U           5KH             E       2W
 71.001  ASK+   R
 71.002  HEAD         {CURRENT CALIBRATION VERIFICATION}
 71.003  DISP         CONNECT TEST CABLE TO 8040A mA AND COMMON TERMINALS
 71.004  MESS         ON THIS TEST VERIFY THAT mA AC FUNCTION IS SELECTED
 71.005  5100   2     1.9mA          .005U                                  2W
 72.001  MESS
 72.002  5100   200   190uA          .6U                                    2W
 73.001  5100   2     1.9mA          .006U                                  2W
 74.001  5100   20    19mA           .06U                                   2W
 75.001  5100   200   190mA          .6U                                    2W
 76.001  5100   2000  1900mA         6U                                     2W
 77.001  HEAD         {FINAL CALIBRATION ADJUSTMENT}
 77.002  DISP         Connect test cable to 8040A VOLT-OHM and COMMON input
 77.003  DISP         UNFOLD MAIN PCB (follow procedure in 8040A manual)
 77.004  5100   2     1V             .0001U         10KH            E       2W
 77.005         5100  1V                            10KH            E  S    2W
 77.006         DISP  {ADJUST R29} FOR A UUT DISPLAY OF [MEM1] +/-.0001
 77.007         JMP   77.004
 78.001  DISP         RETURN MAIN PCB (follow procedure in 8040A manual)
 78.002  JMP          1.002
 78.003  DISP         YOUR 8040A CALIBRATION/VERIFICATION ROUTINE IS COMPLETE
END
```

Figure 1-1. Example Procedure (cont)

ADJUSTMENT THRESHOLD:

The ADJUSTMENT THRESHOLD is used when you are executing procedures that contain optional adjustments meant to bring the UUT into calibration specifications. After each test is executed, the results are evaluated. This evaluation generates a PASS, FAIL, and % TOL. The % TOL is the percentage of allowed error for the test. For example, if the procedure requires the UUT to be within 1% at 100 volts, and the system stimulus necessary to make the UUT read 100.0V is 100.5 volts, the error would be 0.5V. The % TOL would be 50%. (The %TOL is equal to the error divided by 1% and multiplied by 100.) In other words, the UUT is 50% in error of its total allowable error. All % TOLs greater than 100 are failures.

If % TOL of the test is greater than the adjustment threshold and the procedure contains an adjustment for the test, the operator can perform the adjustment portion of the procedure by pressing the [ADJ] display key. Consequently, if the adjust threshold is zero, the operator can always perform an adjustment. If the adjust threshold is larger than 500, the operator will not be given the opportunity to adjust, except in the event of operator-evaluated tests that fail. (See the description of EVAL FSC.) Optional adjustment routines may be made mandatory through the use of ASK- J. (See the description of ASK- FSC.) Normally, depending on the lab philosophy, the adjustment threshold will be between 50% and 100%. The default value is 70%.

NUMBER OF TESTS:

This heading indicates how many tests the procedure contains. A test is defined as a portion of the procedure that produces a result that can be evaluated. In the example procedure, a test is identified as the integer portion of the STEP numbers (described later). The System automatically computes and enters this number.

NUMBER OF LINES:

This heading indicates how many lines, including the header, the procedure contains. The System automatically computes and enters this number.

CONFIGURATION:

This heading contains a list of all the instruments required to perform the procedure, including any instruments required for enhancements. The instrument list may contain some of the following:

Fluke 1953A	Fluke 2205A
Fluke 5100B/Wideband	Fluke 5200A
Fluke 5205A	Fluke 5220A
Fluke 5440A	Fluke 5450A
Fluke 6010A/11A	Fluke 6060A
Fluke 6070A/71A	Fluke 8502A/05A
Fluke 8506A	Fluke 8520A
Fluke 7405 TI Panel	Fluke 7410 TI Panel
Tektronix CG5001	TransistorDevices DLVP
Valhalla 2500EP	Wavetek 278A

When the procedure is selected, the configuration is displayed to the operator for reference. It is not compared against hardware actually present (connected) in the system, and the operator will be responsible for determining that all required instruments are present in the system.

Procedure Body

The remainder of the procedure (from the Procedure Header to the End line) is called the Procedure Body. It consists of executable procedure lines. The procedure lines are divided into labeled columns (fields) by a line of text that immediately follows the header. These fields are referred to by name throughout this manual. All procedure lines in the procedure body have a Step number and an FSC (Function Selection Code).

STEP NUMBERS

The Step is a number associated with each procedure line and may be a number between 1.001 and 299.999. The Step numbers may be used to identify tests. A test is a portion of the procedure that will generate a test result. A test number is identified as the integer portion of the Step numbers. In the example procedure, test 1 consists of Step numbers 1.001 to 1.006. Test 15 consists of Step number 15.001. In addition to this usage, the Step numbers may show that certain FSCs are continued. For example, if a multiline display is desired, each line will contain identical Step numbers (e.g., lines 37.011). A final use of the Step numbers is to indicate where the procedure should "jump" to another test (JMP). The Step numbers are automatically computed by the Procedure Generator.

FSC DEFINITION

The FSC (Function Selection Code) indicates the function of the procedure line. The following paragraphs present examples, taken from the example procedure, that elaborate on this definition.

In the example procedure, the first line contains the SET FSC. This FSC will take automatic range messages and incorporate them into the Setup list. This list appears when the STEP option is selected during a post-test summary that is presented upon completion of a calibration test.

Line 1.002 contains the HEAD FSC. This FSC writes a heading on the 1722A display during the calibration procedure. This header is used to inform the operator of the actions being performed.

In lines 1.006 through 9.001, the 5100 FSCs indicate that the 5100B Calibrator will be used to supply dc voltages to the UUT. These lines of the procedure will result in an evaluation and test result.

FLOW OF EXECUTION IN A PROCEDURE

Lines 24.003 through 24.005 in the example procedure have an indented FSC. This indicates that the indented lines constitute an optional adjustment to calibrate the UUT. If the result from a test is greater than the Adjustment Threshold (line 24.002) or if the operator selects [NO] in response to the question in an EVAL FSC, then the operator has to choose one of two options, [ADJ] (adjustment) or [ADV] (advance). If [ADJ] is selected, the indented portion of the procedure will be executed. If [ADV] is selected instead, the indented portion will be skipped, and the next non-indented procedure line will be executed.

Adjustments may also be made mandatory by the procedure writer. (See the description of the ASK- FSC.) This general flow is indicative of the entire procedure execution. Once the End line is reached, or the operator selects [TERM] (terminate) from the post-test summary, the procedure execution is complete and results may be saved.

FSC Formats

The fields (columns) of the procedure lines following the FSC give specific information about the FSC. There are three general FSC formats: Evaluation, Message, and Transparent.

The information required in the remaining columns (RANGE, NOMINAL, TOLERANCE, MOD1, MOD2, MOD3, MOD4, and CON) will vary with the type of FSC called on that line. The requirements of the remaining columns are discussed under the heading for that particular FSC. For more detail on specific FSC assignments of these parameters, refer to the FSC descriptions in Section 4 of this manual.

EVALUATION FSCs

Evaluation FSCs allow for the testing of a UUT and generate a pass/fail result for each test.

For this FSC, the RANGE column is used to indicate the UUTs range that will be tested during this particular test. However, if the Step is an optional adjustment, the RANGE column indicates the FSC. (Refer to Figure 1-1, lines 1.006 through 9.001.) The NOMINAL column contains the desired UUT reading, in appropriate units. For an example of the NOMINAL format, see line 1.006 in Figure 1-1.

The TOLERANCE column contains the specification of the UUT for a particular test. Tolerance may consist of x/ (x% of the range), x% (x% of the nominal), or xU (+/- x nominal units). For example, if the nominal is in mV, 3U indicates a tolerance of +/- 3 mV. If any type of tolerance is prefaced by a + or -, this prefix indicates asymmetrical limits. A + means above nominal and - means below nominal. For example, +3U -1% with a nominal of 100 mV gives a tolerance region of 99 mV to 103 mV.

The MOD1 field is a modifier that is used to indicate the frequency for ac tests. The MOD2 and MOD3 fields indicate special functions such as ohms reference for dBm or trigger slope. The MOD4 field is used to indicate one of four test types (Evaluation pass/fail test, Setup test, Nominal set test, and Compare test). The Evaluation test (no entry for MOD4) produces a pass/fail test with results that can be evaluated. The Setup test (MOD4 is S) indicates a stimulus-only function (see line 24.003 in Figure 1-1). No test result appears with an instrument FSC followed by S (such as in an adjustment). The Nominal Set test (MOD4 is N) saves the result of the test in a memory location for use with another test. Note that this test does not test (MOD4 is C) evaluates the result against a previously stored value (such as one generated with an Nominal Set test) instead of the NOMINAL. This sequence is designed for frequency response tests.

The CON (connection) field is used to indicate whether the output stimulus of the 7411B is a two-wire connection (CON is 2W), as in line 2.001 of Figure 1-1, or a four-wire connection (CON is 4W).

Two special Evaluation FSCs (EVAL and RUNE) require less information in their columns than normal Evaluation FSCs. The EVAL FSC, which allows the operator to make an evaluation of the UUT, requires information similar to the Message FSCs. The RUNE FSC requires information that is similar to a Transparent FSC. Please refer to the appropriate paragraphs for these two Evaluation FSCs.

MESSAGE-ORIENTED FSCs

Message FSCs are used primarily for presenting instructions and other information to the operator via the 1722A display.

The information to be displayed is entered on the column line following the Message FSC. This information may be any form of alphanumeric characters. In the example procedure of Figure 1-1, the second line in the body of the procedure contains HEAD as the FSC, and the rest of the line contains the actual heading. Any Message FSCs that contain information in braces ({ }), as in lines 1.002 and 23.003 of the example procedure, perform a unique function. The braces will not be printed out when the procedure is executed. However, the information within the braces will automatically be included in the calibration results. This provides a convenient means of placing headings for test results in your results printout.

TRANSPARENT FSCs

Transparent FSCs perform their functions without operator interaction. They are "invisible" to the operator.

The format for Transparent FSCs depends on the particular FSC used. Refer to the individual FSC descriptions in Section 3 for a complete description of Transparent FSC formats.

LINE-BY-LINE DESCRIPTION OF EXAMPLE PROCEDURE

Figure 1-1 illustrates an example procedure written to verify and calibrate a Fluke 8040A Digital Multimeter. The type and sequence of tests for this calibration procedure was derived from the Calibration Adjustment procedures in the 8040A Instruction Manual.

The procedure in Figure 1-1 contains 78 tests in 297 total lines. Lines 1.001 through 1.005 contain preliminary settings for the Fluke 8040A. The RUN FSC in line 1.003 calls a compiled BASIC program called FEPP1 that performs a special function in this procedure. Normally, it is not necessary to access BASIC programs from your procedure.

Lines 1.006 through 22.001 contain nine dc voltage performance tests and thirteen ac voltage performance tests using the 5100 and 5205 FSCs in various modes. Each of the FSCs produce automatic range, connection, and adjustment messages. The FSCs also calculate and store the results of the test.

Lines 23.001 through 31.001 contain nine resistance performance tests using the RESF, RESV, and MEMC FSCs. The ASK- FSC in line 23.002 prevents the test from stopping at a post-test summary for the preliminary measurements. Lines 25.001 through 25.024 calibrate the low resistance ranges of the UUT. The first five lines store the resistance of the test leads in MEM1. Line 25.006 is a RESF FSC in the Nominal set mode, which means the actual system value required to source 100 ohms is stored in MEM and no evaluation is made. The next line adds the offset stored in MEM1 (the resistance of the test leads) to the actual system output or source in MEM. The following line produces an evaluation based on a comparison between this sum (MEM and MEM1) and the 100 ohms nominal. Lines 25.009 through 25.024 constitute an adjustment routine that is executed if the test fails and the operator chooses to perform the adjustment. The remaining lines test the other resistance ranges of the 8040A using the offset (test lead resistance) determined in line 25.003.

Lines 32.001 through 36.001 contain five dc current performance tests using the 5100 FSC. The BASIC program called by the RUN FSC in line 32.001 (FEPP2) puts a -1 or +1 value into MEM1 (similar to the OPBR FSC) based on whether the jump flag is reset (FEPP1) or set (FEPP3). If the jump flag is set, the dc current performance tests and the initial calibration tests are skipped.

Lines 37.001 through 38.004 contain two initial calibration tests using the 8502 and 1953 FSCs. The OPBR and JMPF FSCs in lines 37.002 and 37.003 cause the procedure to end if the performance tests are successfully completed. The OPBR and JMPF FSCs in lines 37.005 and 37.006 allow the operator the option to skip the initial calibration tests. The ASK- FSC in line 37.009 turns off all automatic messages. The CON FSC informs the operator of the type and placement of UUT connections.

Lines 39.001 through 78.003 contain 40 calibration tests using nearly all of the evaluation-producing FSCs. Note that line 42.002 is a RUN FSC calling the BASIC program FEPP3, which sets the jump flag. This causes lines 24.001 through 31.001 to be executed (following the flow of the procedures given in the 8040A Instruction manual). Control is then passed back to 42.004 in order to continue the calibration tests and adjustments. The second to last procedure line (78.002) reruns the entire procedure to verify a successful calibration. After the procedure is verified, the JMP FSC flag is set, which causes the last line of the procedure to be read. This line produces a display to the operator that indicates the UUT has been calibrated.

INTRODUCTION

This section provides a step-by-step approach to writing a calibration procedure. It provides you with a thorough introduction to the procedure writing process. Display keys (small reverse-video blocks or outlined boxes that appear on the Controller's screen) are indicated by square brackets in the text.

The example references two figures. Figure 2-1 illustrates a typical instrument calibration chart (in this case for the Fluke 8022A Digital Multimeter). The procedure that corresponds to this chart appears in Figure 2-2.

GETTING STARTED

The example requires a Fluke 1722A Instrument Controller with 512K RAM (like the one supplied with the 7404B System). No other system hardware is necessary.

There are several preliminary steps to perform before you actually begin to write a procedure. These steps include setting up the Controller, loading the software into the Controller, and entering the Header information of the procedure.

RESISTANCE CALIBRATION

RANGE	INPUT RESISTANCE	TOLERANCE	CALIBRATION COMPONENT
200 ohms	100 ohms	.9 ohm	None
2 kilohms	1.0 kilohms	.005 kilohm	None
20 kilohms	10 kilohms	.05 kilohm	None
200 kilohms	100 kilohms	.5 kilohm	None
2000 kilohms	1000 kilohms	5 kilohms	None
20 megohms	10 megohms	.2 megohm	None

DC VOLTAGE CALIBRATION

RANGE	INPUT VOLTAGE	TOLERANCE	CALIBRATION COMPONENT
200 mV	+190 0 mV	.6 mV	None
200 mV	-190 0 mV	6 mV	R6
2V	+1 90V	006V	None
20V	+19V	06V	None
200V	+190V	6V	None
1000V	+1000V	3V	None

AC VOLTAGE CALIBRATION

RANGE	INPUT VOLTAGE	INPUT FREQ.	TOLERANCE	CALIBRATION COMPONENT
200 mV	190 mV	100 Hz	1 6 mV	R4
2V	1.9V	100 Hz	016V	None
20V	19V	100 Hz	16V	None
200V	190V	100 Hz	1 6V	None
750V	750V	400 Hz	9V	None

Figure 2-1. Typical Multimeter Calibration Procedure

Complete the following steps before beginning the Procedure Writing Tutorial example:

1. Set up the 1722A, and verify that it is operational. (Refer to the 7411B Operator Manual for instructions.)

2. If your 7411B system was configured as a floppy disk system, you will need to insert the 7411B Calibration Disk 1 into the disk drive of the 1722A, and press RESTART (on the 1722A front panel). If your system was configured as a hard disk system, all system software is already on hard disk, which in this case is assigned as the system disk.

3. If your system disk is a floppy disk, wait for the disk to load (approximately 2 minutes).

4. Again, only in the case of a floppy disk based system, you will receive a number of instructions on the screen. After following the instructions, press [ADV].

5. When the Fluke Calibration System Directory appears, select [EDIT PROCEDURE].

6. Ensure that the keyboard is connected to the Controller, and then press [YES].

7. From the Procedure Generator/Editor Menu, select [CREATE NEW]. Then select [EXECUTE SELECTION].

8. When the new screen appears, press [CHNG], and type FLUKE 8022A <RETURN>.

9. Press [DOWN] twice, and the date should be entered automatically.

10. Press [DOWN] once. Press [CHNG], and then type in your name.

11. Press [LAST]. The word "END" should now be displayed.

12. Press [INST].

```
JOHN FLUKE MFG. CO., INC.                                    7411B PROCEDURE
================================================================================

INSTRUMENT:              FLUKE 8022A

DATE:                    23-Feb-87
AUTHOR:                  YOUR NAME
REVISION:                0

ADJUSTMENT THRESHOLD:    70%

NUMBER OF TESTS:         6
NUMBER OF LINES:         32
CONFIGURATION:           Fluke 5100B

================================================================================

 STEP    FSC     RANGE NOMINAL        TOLERANCE      MOD1         MOD2  3  4  CON

  1.001  HEAD          DC VOLTAGE CHECKS
  1.002  DISP          TURN INSTRUMENT ON
  1.003  5100    200   190mV          .6U                                    2W
  2.001  5100    200   -190mV         .6U                                    2W
  2.002          5100  -190mV                                             S   2W
  2.003          DISP  TURN DC CAL POT (R6) FOR UUT READING OF -190.0
  2.004          RPT
  3.001  5100    2     1.9V           .006U                                  2W
  4.001  5100    20    19V            .06U                                   2W
  5.001  5100    200   190V           .6U                                    2W
  6.001  5100    1000  1000V          3U                                     2W
END
```

Figure 2-2. 7411B Procedure

CREATING THE BODY OF THE PROCEDURE

The next phase of procedure writing is to create the procedure body. This is where the specific instrument tests are entered. Specific instrument tests are accomplished using FSCs (Function Selection Codes) and the data is entered in the FSC information fields. Specific instrument tests are prefaced with headings for each test. After inserting the heading for the test, the proper FSC (for the required stimulus output) is selected, and its information fields are completed. This process is repeated (with several options) until the UUTs parameters have been entered.

Complete the following steps to label the dc voltage checks of the Procedure Writing Tutorial example:

1. Press [HEAD] and type DC VOLTAGE CHECKS <RETURN>.

2. Press [NEXT].

3. Press [DISP] and type TURN INSTRUMENT ON <RETURN>.

4. Press [NEXT].

Entering Calibration Data

Figure 2-1 shows a typical list of calibration data for a multimeter (in this case the Fluke Model 8022A). This type of data is used to derive the information required for FSC information fields. In this example, the 5100 FSC has been called. This FSC causes a stimulus output from the 5100B Meter Calibrator. The information fields of the 5100 FSC indicate the exact voltage/range and tolerance of the stimulus output and the type of test being performed.

Complete the following steps to call the 5100 FSC and enter the appropriate date in its parameter fields:

1. Press [5100] and type 190MV 200R .6U <RETURN>. (190MV, 200R, and .6U must be separated by spaces.)

2. Press [NEXT].

NOTE:

Data entered will be verified and reordered before being accepted by the system. Since the system

remembers range and tolerance information, you will not have to enter range and tolerance information for subsequent tests using the 5100 FSC.

3. Press [5100], and type -190MV <RETURN>. (Any information added by the system, see note above, will be underlined.)

Entering an Optional Adjustment Routine

Adjustment routines are used when the UUT requires an adjustment to be made in order to calibrate the instrument.

The 8022A Multimeter contains two components (potentiometers R4 and R6, see Figure 2-1) that may require adjusting to bring the meter into calibration. Adjustments may be optional (the operator determines whether or not an adjustment is required) or mandatory (the operator must make the adjustment). For the purpose of this example, the steps to create an optional adjustment routine in a dc voltage test are shown.

Complete the following steps to create an optional adjustment routine (subprocedure):

1. Press [ADJ].

2. Press [5100] and type -190MV 2R <RETURN>.

NOTE

The system will recognize that this line is part of an adjustment routine and will add an "S" in the MOD4 field indicating a Setup test.

3. Press [ADJ].

4. Press [DISP], and type TURN DC CAL POT (R6) FOR UUT READING OF -190.0 <RETURN>.

NOTE

The proper message will now appear when the stimulus output is -190mV. Repeating the failed test will verify that the adjustment was made properly.

5. Press [ADJ].

6. Press [RPT].

Entering the Remaining Calibration Tests

Now that the basic form of entering data for the body of the calibration procedure has been shown in detail, the remaining data to be entered will be summarized as follows:

1. Press [NEXT].

2. Press [5100], and type 1.9V .006U <RETURN>.

3. Press [NEXT].

4. Press [5100], and type 19V 20R .06U <RETURN>.

5. Press [NEXT].

6. Press [5100], and type .6U 200R 190V <RETURN>.

NOTE

The order of entry for the FSC parameter fields makes no difference.

7. Press [NEXT].

8. Press [5100], and type 1000R 1000V 3U <RETURN>.

NOTE

The number of spaces between parameter field entries makes no difference. (There must be at least one.)

To enter the remaining tests, use the RESF FSC for resistance calibration, and use the 5100 FSC for ac voltage calibration. Refer to Section 4 for details on the use of these FSCs.

SAVING THE PROCEDURE

After completing the body of the calibration procedure, you must write (save) the entire calibration procedure to a disk for future use.

Complete the following steps to write a calibration procedure to a disk:

1. Press [TERM].

2. Press [BACKUP].

3. When the Save Menu appears, select [SAVE].

4. Select [EXECUTE SELECTION].

5. If your 7411B system was configured as a floppy-disk based system you will be prompted to insert a "formatted" Procedure Storage disk. (Refer to the 7411B Operator Manual for a description of a "formatted" Procedure Storage disk.)

6. Press [ADV]. The calibration procedure is now stored on disk for future use. (Refer to the 7411B Operator Manual for instructions on executing the stored calibration procedure.)

Section 3
Using the Edit a Procedure Option

INTRODUCTION

The novice procedure writer should read the Procedure Writing Tutorial in Section 2 before using the material in this section. The tutorial provides an overview of procedure writing and serves as an introduction to the system. This section describes all the procedure writing options in complete detail and relies on the tutorial's overview to inform the procedure writer of the appropriate option to be selected.

HARDWARE REQUIREMENTS FOR PROCEDURE WRITING

Your only hardware requirement for writing calibration procedures is a 1722A Instrument Controller with the 512K RAM Expansion Board. You do not have to connect the Controller to the system.

LOADING THE 7411B COMPUTER-AIDED CALIBRATION DISK

You may restart the 7411B system at any time using the Restart procedure. If you have a floppy based system, refer to the 7411B Operator Manual for detailed instructions on how to insert and load disk into the Controller.

Complete the following steps to perform the restart procedure, in case of a floppy based system:

NOTE:

For a hard disk based system these steps are unnecessary, instead, the program will be reloaded automatically from hard disk (make sure no floppy disk is in the drive.)

1. Insert the 7411B Calibration Software Disk 1 into the disk drive of the Controller.

2. Press the RESTART switch on the front panel of the Controller. The System Software will then be loaded into RAM (approximately 2 minutes).

3. If so requested, remove Calibration Software Disk 1 from the floppy disk drive an Insert Calibration Software Disk 2 and press ADV.

4. After loading the system software (with or without Calibration History Management Software), touch ADV. The System Directory then appears as shown in Figure 3-1.

SETTING THE DATE AND TIME

The date and time clock of the Controller can be set two ways. During Restart, the system may ask that the date and time be set. The date and time prompt appears if the system has been powered down for a considerable period of time or if circuit boards have been removed from the Controller. When the Controller asks for the date, enter the date using a numeric month, day, and year (two digits for each) followed by a <RETURN>. These entries may be separated by any non-numeric character. When the Controller asks for the time, enter

the time in 24-hour form (e.g., 8:30 pm = 20:30) followed by a <RETURN>. Use any non-numeric character to separate hours from minutes.

If you wish to reset the clock for a leap year or daylight savings time, for example, you do not need to use the RESTART procedure. You can reset the clock from the System Directory by typing CTRL/T. Press and hold down the CTRL key while pressing the T key. After the screen clears, type CTRL/P. This will cause the System to enter FDOS (Floppy Disk Operating System). From FDOS, type TIME <RETURN>. Then enter the date and time as described above. To return to the System Directory, press the RESTART switch on the front panel of the Controller, then press [TERM].

SYSTEM DIRECTORY OPTIONS

The System Directory (shown in Figure 3-1) presents a list of choices from which you select the task to be performed. The System Directory appears after the

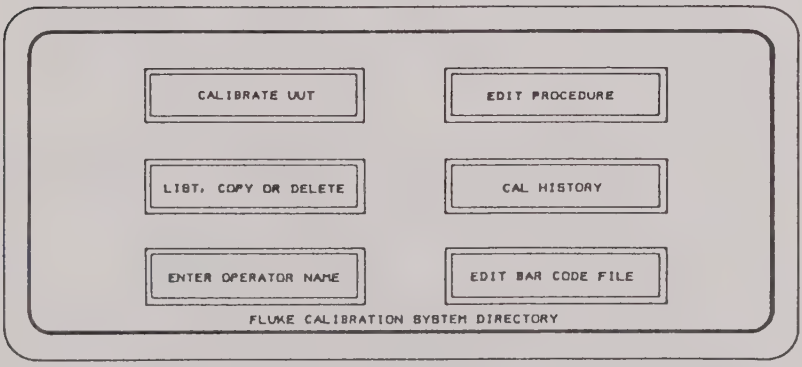

Figure 3-1. System Directory

Computer-Aided Calibration disk is loaded and after each edit session or system option is completed. The procedure writer selects the desired option by pressing

the appropriate square. The following paragraphs give a brief description of each selection from the System Directory.

NOTE:

Only the Edit a Procedure option will be explained in detail in this section. The other three options are described in brief to provide a better overall understanding of the 7411B System.

Calibrate a UUT Option

The Calibrate a UUT option is used by the system operator. It allows the operator to select the proper procedure for the particular instrument and to proceed with its calibration. Since the steps necessary to calibrate an instrument will vary from unit to unit, separate calibration procedures are required for each different instrument. Different instruments that have the same calibration procedures may be grouped together in the same procedure. The actual calibration procedure is stored on a separate disk (Procedure disk) from the system software.

If the Calibrate an Instrument option is chosen, the System Directory is replaced by a display that prompts the user to insert a Procedure disk.

List, Copy or Delete Data Option

The List, Copy or Delete Data option is used to manipulate procedure and results files. The major functions of this option are to delete procedures or results from disks, copy procedures or results from disk to disk or to and from a host computer, list procedures or results, and obtain a listing of the procedures and results stored on disks. This listing

may be sent to the screen or to a printer. Refer to the 7411B Operator Manual for a complete description of this option. After executing this option, the system returns to the System Directory.

Edit a Procedure Option

The Edit a Procedure option enables you to write a new procedure, create a new procedure from an existing one, or change part of (edit) an existing procedure. The System Directory appears when you exit this option.

Cal History Management Option

The Cal History Management option allows the operator or calibration supervisory personnel to access and print the calibration history of an instrument. This information is automatically generated by the System Software.

If the Cal History Management option is chosen, the System Directory is replaced by a display that prompts the user to insert the Calibration History Management disk and press the RESTART switch on the front panel of the Controller. Execution of the Cal History Management option will begin immediately after the Cal History Management disk is loaded into RAM. To terminate this option (and to return to the System Directory), press [TERM].

Edit Bar Code File Option

The 7411B system software is able to keep inventory of instruments that can be calibrated on the system. A bar code file contains the property codes and the serial number and the name of the appropriate procedure to calibrate that instrument. Using this menu additions and deletions can be made to the file(s) containing the property codes. (Since the 1722A limits the size of a

single file to 64K-bytes, bar code files larger than 64K-bytes are broken into multiple files. Note that this is transparent to the user -- the 7411B system always acts like the bar code file is a single file.)

HOW TO WRITE OR MODIFY A PROCEDURE

The first thing you need to do is to load the Computer-Aided Calibration software and select the Edit a Procedure option from the System Directory. Afterwards, the display shown in Figure 3-2 will appear, requesting you to verify that the Keyboard is connected. Continue by pressing [YES]. (Pressing [NO] will return you to the System Directory). After answering yes to the keyboard prompt, the Procedure Generator/Editor Menu will appear as shown in Figure 3-3.

Three of the Procedure Generator/Editor menu options are involved with the actual procedure writing task. The Return to System Directory option returns you to the System Directory (useful if you change your mind or select the wrong option). Which of the three (procedure writing) options you use depends upon the nature of the calibration procedure you want.

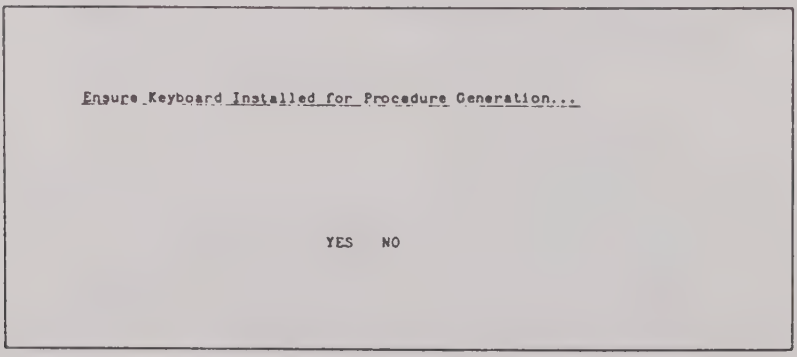

Figure 3-2. Ensure Keyboard Installed Display

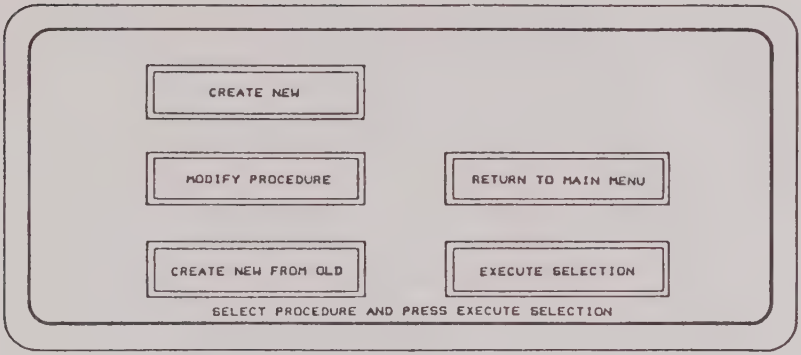

Figure 3-3. Edit a Procedure Menu

Create New (Procedure) Option

The Create New Procedure option is used when there is no existing procedure that can be easily edited to create the desired procedure. This option loads a blank procedure form. You must then enter in the required information and save the new procedure. In case of a floppy disk based system, the procedure must be saved on a Procedure disk.

Create New From Old Procedure Option

The Create New From Old Procedure option is used when an existing procedure can be easily edited to create the desired procedure. This option uses a copy of an existing procedure that is then edited to create a new procedure.

Note that in the 7411B system procedures are stored in a file which name matches the name in the "Instrument:" field. When the "Create New From Old" option is chosen, this field comes up blank. You should enter a new name before saving the procedure. When the editing session is over, the edited procedure is saved on disk along

with the original procedure. In case of a floppy disk based system, the new procedure may be saved on the same Procedure disk as the original or on a different disk.

Modify Procedure Option

The Modify Procedure option is used when it is necessary to add, change, or delete capabilities in an existing procedure. It may be used, for example, to correct a mistake in a procedure. This option uses an existing procedure stored on a disk. When you are finished modifying the procedure, the original procedure is removed and replaced with the new revised procedure. If your system was configured as a floppy-disk based system, the new revised procedure must be stored on the Procedure disk that contained the old procedure.

Selecting an Existing Procedure for Create or Modify

If you choose the Create New From Old Procedure option or the Modify A Procedure option, you must first select an old procedure to edit or modify. When you make your selection from the Procedure Generator Editor menu, you are be prompted to insert the appropriate Procedure diskette (the one on which the desired procedure resides), if your system was configured as a floppy based system, as shown in Figure 3-4. When you insert the disk into the disk drive and press [ADV], the system searches the Procedure disk for procedures. The 7411B system configured as a hard disk system looks for procedures on hard disk. In any case, the 7411B system responds with the display shown in Figure 3-5.

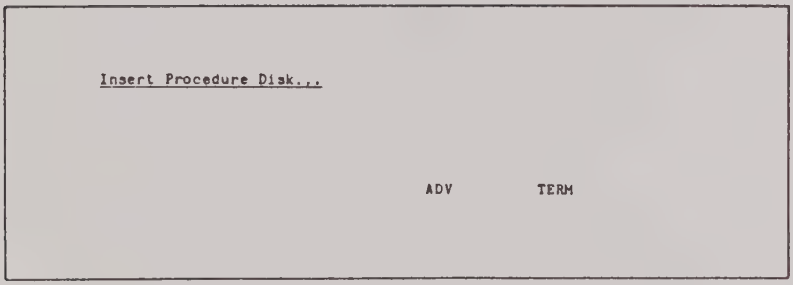

Figure 3-4. Insert a Procedure Disk Display

```
Procedure Names:

Procedure_name_1 (in reverse video)
Procedure_name_2                          UP
Procedure_name_3
Procedure_name_4
Procedure_name_5                          DOWN
Procedure_name_6
Procedure_name_7
Procedure_name_8                          SELECT
Procedure_name_9
Procedure_name_10
Procedure_name_11                         RESELECT
Procedure_name_12

1 of xx              SELECT PROCEDURE
```

Figure 3-5. Select Required Procedure Display

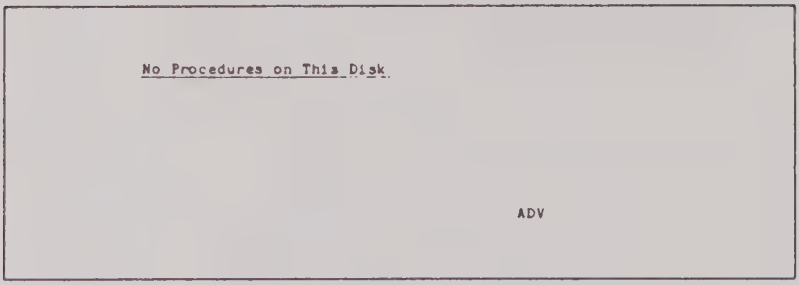

Figure 3-6. No Procedures Display

The Procedure Selection menu contains the first 12 procedure names that were found on disk and the first procedure name shows in reverse video. On the right side on the screen are four display keys. When you touch the [UP] display key, the reverse-video block scroll up to the procedure name above. When the reverse-video block reaches the top, the display scrolls around and displays the previous 12 procedure names found in the directory.

When you press the [DOWN] display key, the reverse-video block scrolls down until the last procedure on the screen (e.g. Procedure_name_12) is reached. If you press the [DOWN] display key again, another set of 12 procedure names is shown, e.g. Procedure_name_13 through Procedure_name_24, with Procedure_name_13 in reverse video. When the last procedure is reached, the procedure selection loops around and restarts the menu with the first 12 procedure names showing.

When the desired procedure name is in reverse video, you press the [SELECT] display key read into memory the procedure. (See Figure 3-7.)

While in the procedure selection menu, you may want to decide not to edit any procedure at all. If that is the

case, you can press the [RESELECT] display key to the Edit Procedure Menu as shown in Figure 3-3.

Also note that in the left lower corner of the procedure selection display the "1 of xx" where xx turns out to be the number of procedures found on disk. When you scroll down, you will note that "1 of xx" changes to "2 of xx" and so on. This number is only intended to give the user a reference where he is in the sequence of available procedures. These numbers do not reference a particular procedure. For example if a procedure is added or deleted, the order in which procedures are shown in the procedure selection menu may change. If there are no additions or deletions, the order of the procedure names in the procedure selection menu will stay the same.

If there are no procedures on disk, the entries for the procedure names are all empty. (See Figure 3-6.) If there is also no directory structure, the message "No Procedures on Disk" appears briefly and the Edit Procedure Menu is presented again.

General Comments Before Continuing

THE SELECTED PROCEDURE

The remainder of Section 3 describes operations on the procedure that is loaded into the electronic disk for modification and pertains to either Write a New Procedure or one of the options that select an existing procedure for editing. The display shown in Figure 3-7 announces the transfer from the floppy or hard disk to the electronic disk.

SAFETY NOTES

Potential safety hazards may arise from improper procedure writing (see Table 3-1).

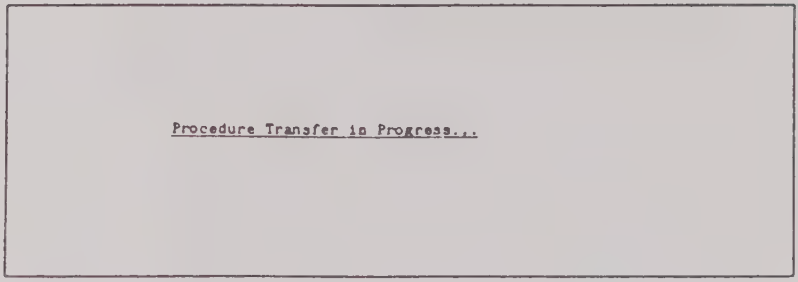

Figure 3-7. Procedure Transfer Display

WARNING

AFTER A PROCEDURE IS WRITTEN, ENSURE THAT IT DOES NOT CONTAIN ANY OF THE SAFETY HAZARDS DESCRIBED IN TABLE 3-1.

The Procedure Edit List Options

Once the procedure is loaded, the procedure writer is presented with a display of the Procedure Edit List, which provides the capability to select the type of edit function to be used. This display is shown in Figure 3-8.

The display keys on the left side of the display allow the selection of the line to be modified. The display keys on the right side of the display allow the selection of the edit function. The available options are discussed in the paragraphs that follow.

In the following paragraphs, the discussions concerning the [DELT] (delete), [INST] (insert), and [CHNG]

Table 3-1. Safety Notes

SAFETY NOTE	COMMENTS
1	Be aware that the system stimulus is programmed to stand by after each non-Setup test and just prior to presentation of the post-test summary (for any reason such as a terminate test result or indication of system error). This action avoids many potential hazards to the operator.
2	When writing procedures that use setup stimulus steps (S), always carefully test the procedure to ensure that subsequent automatic messages work as anticipated and that there are no hazardous voltages present that the operator could encounter.
3	Displays should not ask the operator to connect or disconnect from a live port.
4	RUN and RUNE programs (refer to Section 3) should not ask the operator to connect or disconnect from a live port. Also, if they program any stimulus, ensure it is programmed to zero before continuing.
5	IEEE commands should not leave stimulus active which will not be safely deprogrammed by the station or another IEEE command.
6	Beware of, and inform operators, that connections to ports other than those specifically active for the test that is executing can be dangerous.

```
JOHN FLUKE MFG. CO., INC.                                  FLUKE PROCEDURE
**********************************************************************

INSTRUMENT:

DATE:                12-Jan-85
AUTHOR:
REVISION:            0



        LAST  NEXT   UP   DOWN        DELT  INST  CHNG  BACKUP
```

Figure 3-8. Procedure Edit List

(change) options have the same format. These discussions begin with a brief description of the option and then describe modifications to the procedure header and the procedure body.

LAST/NEXT Option

The [LAST] and [NEXT] display keys locate the page (one full screen on the Controller) of the procedure that contains the line to modify. The [NEXT] display key displays the next page, and the [LAST] key displays the previous page. These display keys cycle pages as if the procedure were one continuous file. In other words, if the first page is displayed and the [LAST] key is pressed, the last page of the procedure appears. If the last page is displayed and the [NEXT] key is pressed, the first page of the procedure appears.

UP/DOWN Option

The [UP] and [DOWN] display keys specify the line on the page that the procedure writer wishes to modify. One line is always highlighted (to indicate which line is selected for modification at that moment). The [UP] [DOWN] display keys move this highlight up and down.

DELT Option

The [DELT] (delete) display key allows deletion of the highlighted line. This operation also automatically renumbers the procedure steps. Note that if a test causing an evaluation is deleted and there is an indented adjustment routine following that test, the adjustment section is automatically deleted also. Once the delete operation is completed, the page display is rewritten, reflecting the procedure with the deleted line or lines missing. The [DELT], [INST], and [CHNG] display keys are only displayed when they are

applicable to the line that is highlighted. For example, only [CHNG] appears when Adjustment Tolerance is highlighted.

The INSTRUMENT: Line is Unique. [DELT] can be selected with only one instrument entry; however, it will only delete the data following "Instrument," not the entire line.

INST Option

The [INST] (insert) display key allows one or more lines to be inserted immediately preceding the highlighted line. Therefore, if the procedure writer is beginning the edit session with a new procedure, the [LAST] and [NEXT] and [UP] and [DOWN] display keys should be used to locate and highlight the [END] line. Then, by pressing the INST display key, the user can enter lines to create the body of the procedure. The user can enter up to 300 lines into a procedure. If the user attempts to exceed 300 lines, the system produces a display (No More Room), and the edit session can be terminated or DELT can be used to make room for more insertions. If more than 300 lines are needed for a particular UUT, subprocedures may be created and CALLed from the main procedure.

REVERSE-VIDEO PROMPT

A reverse-video line appears during an insert whenever it is necessary for the procedure writer to enter information for a line. When the line is entered, the display is rewritten with the newly entered data, and the procedure writer must choose a new option to continue the edit session.

INSERTS INTO THE HEADER

If the insert into the procedure heading is an instrument, the procedure writer works with the display

shown in Figure 3-9. Up to six instruments (per procedure) may be added. If any leading blanks are typed when inserting an instrument, they will be automatically deleted. This action ensures compatibility with the JMP FSCs.

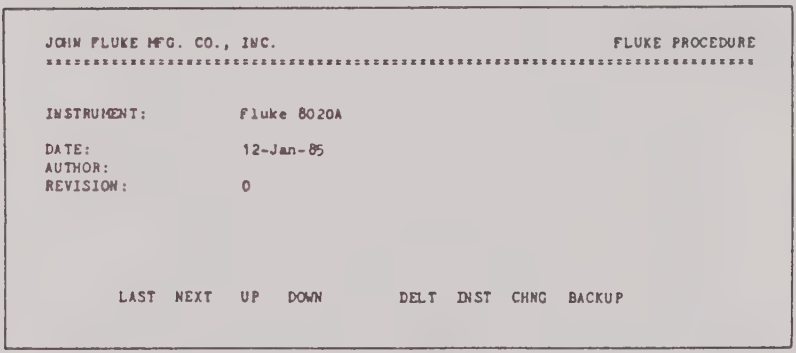

Figure 3-9. Inserts Into Procedure Header Display

INSERTS INTO THE BODY OF THE PROCEDURE

If the insert is in the body of the procedure and there is an existing line preceding the desired insert, the procedure writer is given the option of selecting the type of line to be inserted. The display offering these options is shown in Figure 3-10.

Depending on the line ahead of the line being inserted, various options may be offered. The paragraphs that follow describe these options in detail. The procedure writer must choose the appropriate option in order to continue the edit session. If there are no lines preceding the line being inserted, the system proceeds immediately to Select FSC to Continue.

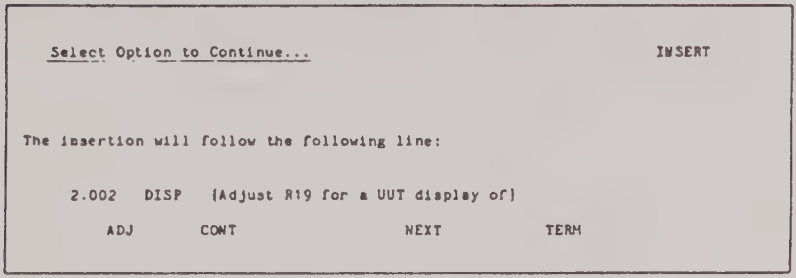

Figure 3-10. Inserts Into Procedure Body Display

CONT Option

The [CONT] (continue) option allows continuation of the preceding line. For example, the previous line may be a [DISP] (display), and the procedure writer may desire a multiline display. When [CONT] is pressed, the next line of the insert will add to the previous one, and a multiline display is created. If the previous line cannot be continued, this option is not available. If the insert is in the middle of a multiline display, the lines following will be renumbered as a new display and not a continuation of the insert.

ADJ Option

The [ADJ] (adjust) option allows the insertion of an indented adjustment into the procedure. For this option to be available, the previous test must perform an evaluation or be part of an already existing indented adjustment routine. After [ADJ] is selected, the next line inserted will be indented. In adjustments, range and tolerance information is not allowed (since no evaluations can take place in an adjustment). When an indented adjustment is performed during procedure execution, the words ADJUST PERFORMED are added to the results data.

NEXT Option

The [NEXT] option inserts any line other than a [CONT] (continuation) or an [ADJ] (adjustment). When using this option, the procedure writer selects from the complete FSC menu.

TERM Option

The [TERM] (terminate) option completes the insert mode. Once [TERM] is pressed, the procedure is renumbered and the Procedure Edit List display (refer to Figure 3-8) is updated to allow the selection of a new edit option. The highlighted line is the next line after the new inserted data.

SELECTING THE FSC

Following selection of [ADJ], or [NEXT] (or immediately if there are no lines before the insert), the procedure writer is given the opportunity to select an FSC. Figure 3-11 illustrates this display. During [CONT] the FSC is known, so this display is omitted.

The FSC selection display presents all of the FSCs that are applicable to the insert. For example, if an ADJ insert had been selected, RUNE, MEMC, and EVAL would not apply (since evaluations are not allowed in adjustments) and would not be displayed. To select an FSC for insertion, the procedure writer presses the display key for the desired FSC. Similar FSCs are grouped together. The top row is comprised of instrument FSCs and FSCs that produce an evaluation.

The bottom row consists of message-oriented FSCs. The left-mid display area consists of control transfer FSCs. The right-mid display area consists of transparent FSCs dealing with memory mathematics, automatic message control, and the RUN FSC.

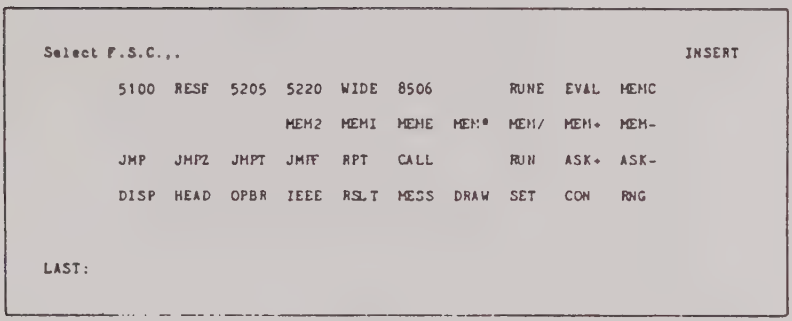
Select F.S.C.,.
INSERT
5100 RESF 5205 5220 WIDE 8506 RUNE EVAL MEMC
MEM2 MEMI MEME MEM* MEM/ MEM+ MEM-
JMP JMPZ JMPT JMPF RPT CALL RUN ASK+ ASK-
DISP HEAD OPBR IEEE RSLT MESS DRAW SET CON RNG
LAST:

Figure 3-11. FSC Selection During Insert Display

ENTERING FSC PARAMETERS

Once the FSC is selected, a blank inverse video line appears to allow typing of FSC parameters. At this time the display looks like Figure 3-12.

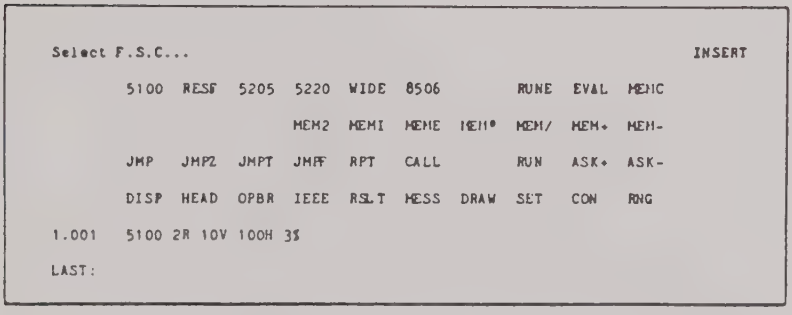
Select F.S.C...
INSERT
5100 RESF 5205 5220 WIDE 8506 RUNE EVAL MEMC
MEM2 MEMI MEME MEM* MEM/ MEM+ MEM-
JMP JMPZ JMPT JMPF RPT CALL RUN ASK+ ASK-
DISP HEAD OPBR IEEE RSLT MESS DRAW SET CON RNG
1.001 5100 2R 10V 100H 3S
LAST:

Figure 3-12. Insert FSC Parameters Display

As shown in Figure 3-12, the step number and FSC are displayed, followed by the reverse video area for

parameter entry. The previous line of the procedure is displayed after LAST:. (This area of the screen is blank when entering the first line of a procedure.) In order to continue, the procedure writer must type the FSC parameters followed by a <RETURN>. Message-oriented FSCs preserve blanks and special characters as they are entered. Other FSC parameters are entered in any order. The only requirement is that at least one blank (space) must reside between parameters. Refer to the FSC Descriptions in Section 3 of this manual for the FSC parameters and other details.

DEFAULT VALUES FOR PARAMETERS

Range and tolerance parameters have default values. Default values may be ascertained by observing the LAST: display. If the LAST: display is blank or no instrument-oriented FSC has been entered in the current insert (i.e., there is no previous record), the default range is no range, and the default tolerance is 0U (0 units). If the LAST: display is not blank, the default values are those of the last instrument-oriented FSC entered. If the LAST: display is instrument-oriented, those values for the range and tolerances will be used. This default specification feature helps the procedure writer write procedures quickly. Because the editor adds the remaining values, only the nominal value and frequency (if ac) need to be entered for most instrument-oriented FSCs. However, the procedure writer must reenter the range and tolerances as they change for the UUT or if special test requirements are desired.

DUMMY DESTINATIONS FOR JUMP-ORIENTED FSCs

If the insert is one of the JMP-oriented FSCs, the destination step refers to the step numbers as they will appear after the insert is completed and the

procedure renumbered. It is often more convenient to assign a dummy destination for JMPs during an insert (like a blank), then go back after the insert is finished and change (CHNG) the dummy values to the actual destinations.

VERIFICATION OF INSERTS

As soon as the procedure writer enters <RETURN>, the system responds, displaying "Verification In Progress" near the bottom of the CRT (blinking). At this time, the system is checking the line entered for validity and entering default values. Finally, if the line is correct, the display shows the line correctly ordered and in the same format as it will be in the procedure. This display of a correct line is shown in Figure 3-13.

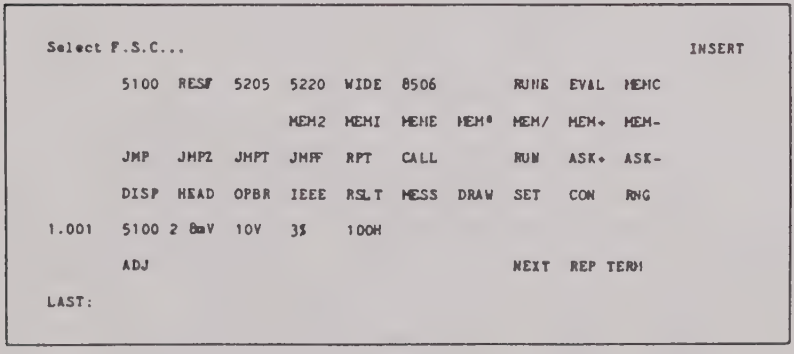
Select F.S.C...
INSERT
5100 RESF 5205 5220 WIDE 8506 RUNE EVAL MEMC
MEM2 MEMI MEME MEM* MEM/ MEM+ MEM-
JMP JMPZ JMPT JMPF RPT CALL RUN ASK+ ASK-
DISP HEAD OPBR IEEE RSLT MESS DRAW SET CON RNG
1.001 5100 2 8mV 10V 3% 100H
ADJ NEXT REP TERM
LAST:

Figure 3-13. Insert Display of a Correct Line

Any default values or items automatically entered or modified by the system are underlined. In Figure 3-13, the 3% tolerance was not entered by the procedure writer, so the system inserted it. The procedure writer

may select any of the options shown by the display keys at the bottom of the screen to continue the edit session. Refer to Table 3-2 for a summary of the options available.

Table 3-2. Summary of Edit Options

OPTION	DESCRIPTION
ADJ	This option is used to insert the next line when it is to be indented (i.e., part of an indented adjustment). This display key appears only if the line just entered was not in error and the previous line was part of an adjustment or if the previous line generates test results.
CONT	This option is used to insert the next line when it is to be a continuation of the previous line. It could be used, for example, to form a multiline display. This option is available only if the previous line can be continued and was not in error. If the previous line was part of an adjustment, the continued line will be part of an adjustment.
NEXT	This option is used to insert the next line when it will not be an adjustment line or a continuation of the previous line. This display key is always available unless there has been an error on the line just entered.
REP	This option is used to repeat the line that was just entered, whether or not it was in error. The repeated line will be in the same context (i.e., adjustment, continued, or next) as the line just entered. This option is always available.
TERM	This option is used to terminate the insert and is always available. It causes an immediate return to the Procedure Edit List display. After selection of this option, the procedure is automatically renumbered. The message 'Processing in Progress' is displayed during this process. If the terminate was done with the last line inserted being one that does not generate results that can be evaluated, and if the first procedure lines following that insert are optional adjustment lines, the adjustment lines will be automatically deleted since they do not make sense in their new context. The Procedure Edit List display highlights the line following the insert.

INSERTION ERRORS

If the procedure writer enters a line that is incorrect for any reason, the system displays the line exactly as entered and displays the type of error in the lower left corner. Figure 3-14 shows this display. Compare it to the display shown in Figure 3-13.

```
Select F.S.C...                                                    INSERT

        5100  RESF  5205  5220  WIDE  8506        RUNE  EVAL  MEMC
                                MEM2  MEM1  MEME  MEM*  MEM/  MEM+  MEM-
        JMP   JMPZ  JMPT  JMPF  RPT   CALL        RUN   ASK+  ASK-
        DISP  HEAD  OPBR  IEEE  RSLT  MESS  DRAW  SET   CON   RNG
1.001   5100 2 8mV 3% 1GH
                                                        REP TERM
REPLACE: 5100 2     8mV   8mV   3%    1KH
ERROR: Nominal/Frequency Incompatible
```

Figure 3-14. Insert Display of an Incorrect Line

The editor identifies the first error it encounters even if there are multiple errors on the line. The error the editor finds may not be the first error entered since internal checks are not made in the entry order. At this time the procedure writer may choose REP or TERM. Refer to Table 3-2 for a description of these options.

CHNG Option

The [CHNG] (change) option, from the Procedure Edit List discussed previously, allows the procedure writer to change the highlighted procedure line. Refer to the LAST/NEXT and UP/DOWN discussions for a description on how to highlight the desired line. This [CHNG] option allows a line of the procedure to be changed to another line. If the line being changed caused an evaluation, it may be changed to a line that does not cause an evaluation (generates test results). However, if the line that caused an evaluation included an indented adjustment routine, then this routine is deleted. Lines that are part of indented adjustment routines may not be changed to lines that produce evaluations. Only the

available options are displayed. If changes beyond this scope are desired, the original line must be deleted and the new line must be inserted.

The change option can be used in two general ways. One way is to make changes in the main body of the procedure (see the INST and DELT discussions also), and the other way is to change lines in the header.

CHANGES TO THE PROCEDURE HEADER

The entry prompt is displayed as soon as the highlighted line is positioned to change a line in the header. For example, to change the ADJUSTMENT THRESHOLD, first position the highlight to that line, as shown in Figure 3-15.

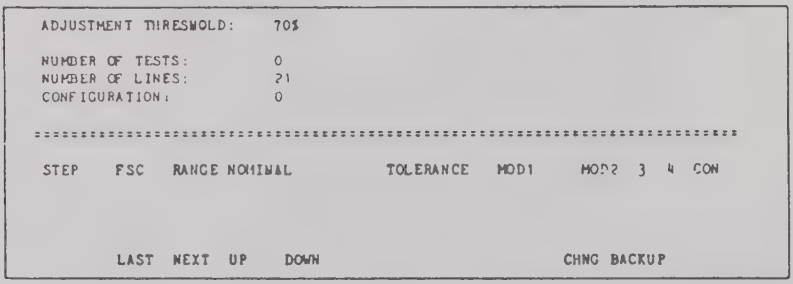
ADJUSTMENT THRESWOLD: 70%
NUMBER OF TESTS: 0
NUMBER OF LINES: 21
CONFIGURATION: 0
STEP FSC RANGE NOMINAL TOLERANCE MOD1 MOD2 3 4 CON
LAST NEXT UP DOWN CHNG BACKUP

Figure 3-15. CHNG Display Showing Highlight

As soon as the highlight is positioned, press the CHNG display key. The system responds with the display shown in Figure 3-16.

As shown in Figure 3-16, the procedure writer is given a reverse video prompt to type in the new ADJUSTMENT THRESHOLD and must type in the new value followed by <RETURN>. As soon as this is done, the system rewrites the display with the new entry. The heading lines for

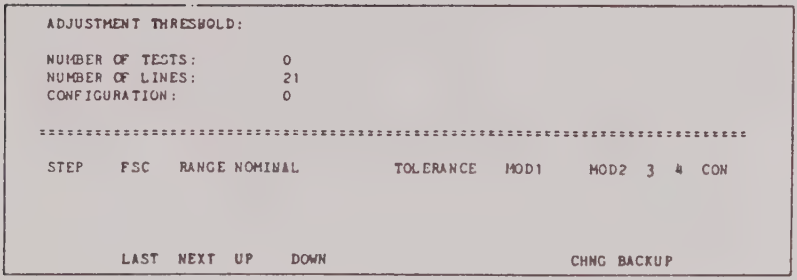
ADJUSTMENT THRESHOLD:
NUMBER OF TESTS: 0
NUMBER OF LINES: 21
CONFIGURATION: 0
STEP FSC RANGE NOMINAL TOLERANCE MOD1 MOD2 3 4 CON
LAST NEXT UP DOWN CHNG BACKUP

Figure 3-16. CHNG Display for a Line in the Header

INSTRUMENT:, AUTHOR:, REVISION:, and ADJUSTMENT THRESHOLD: may all be changed. In general, the lines may contain any alphanumeric data the procedure writer wishes to type; however, the ADJUSTMENT THRESHOLD must contain a positive number or it will default to 70%. The procedure writer may type in the % or it may be inserted automatically.

CHANGES TO THE PROCEDURE BODY

Changing the FSC

The procedure writer selects a line to change by using [LAST]/[NEXT] and [UP]/[DOWN] to highlight the correct line. Figure 3-17 illustrates this display. The user then selects [CHNG] and the system provides a display showing the line being changed (REPLACE...) and all of the available FSCs that may be used. If there is only one FSC choice listed (i.e., after a continued message type), this display is omitted. Figure 3-18 shows how this display appears during a typical change operation.

In response to the display in Figure 3-18, the procedure writer should press the desired FSC. The system then allows the operator to enter data just as in the insert mode.

```
STEP    FSC    RANGE NOMINAL          TOLERANCE   MOD1     MOD2  3  4  CON

  1.001 5100   2     8mV              3%          100H
  2.001 5100   5     20mV             3%          100H
  3.001 5100   10    50mV             3%          1KH
  3.002        5100  50mV                         1KH                  S
  3.003        DISP  ADJUST POT R18 FOR A UUT DISPLAY OF 10 VOLTS
  3.004        RPT
  4.001 5100   20    100mV            3%          10KH
END

        LAST  NEXT  UP    DOWN                          CHNG BACKUP
```

Figure 3-17. Procedure Edit List Prior to Selecting CHNG

```
Select F.S.C...                                                    INSERT

        5100  RESV  5205  5220  WIDE  8506        RUNE  EVAL  MEMC
                          MEM2  MEMI  MEME  MEM*  MEM/  MEM+  MEM-
        JMP   JMP2  JMPT  JMPF  RPT   CALL        RUN   ASK+  ASK-
        DISP  HEAD  OPBR  IEEE  RSLT  MESS  DRAW  SET   CON   RNG


REPLACE: 5100 2     8mV   3%    1KH
```

Figure 3-18. CHNG Display For an FSC in the Procedure Body

Changing the Parameters

The reverse video line following the step number and FSC is the prompt to enter the new FSC parameters via

the Programmer Keyboard, followed by a <RETURN>. If the change is in an instrument-oriented FSC, the default range and tolerance are shown in the REPLACE: portion of the display. Following <RETURN>, the replacement line will be verified. The middle lower portion of the display shows the words "Verification In Progress" while an error search is performed. If there are no errors on the line, the system will show a display like the one in Figure 3-19.

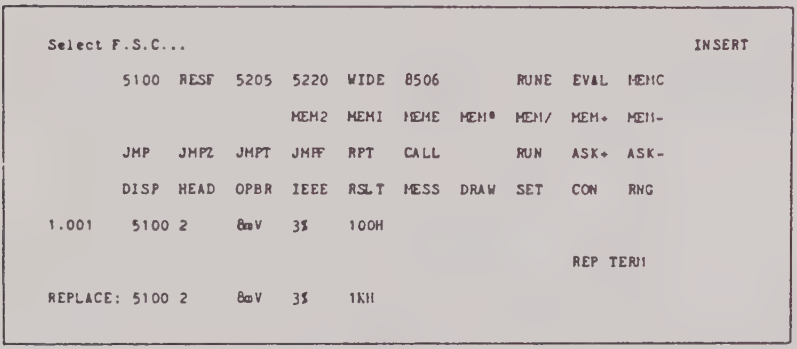
Select F.S.C...
INSERT
5100 RESF 5205 5220 WIDE 8506 RUNE EVAL MEMC
MEM2 MEM1 MEME MEM* MEM/ MEM+ MEM-
JMP JMPZ JMPT JMPF RPT CALL RUN ASK+ ASK-
DISP HEAD OPBR IEEE RSLT MESS DRAW SET CON RNG
1.001 5100 2 &mV 3% 100H
REP TERM
REPLACE: 5100 2 &mV 3% 1KH

Figure 3-19. CHNG Display With No Errors

ERROR CORRECTIONS DURING CHNG

If there are any entry errors, the lower left of the display will indicate the reason for the error. In this case the display will look like the one shown in Figure 3-20.

Refer to Figure 3-20. In the event of an error, the line will be displayed exactly as entered. There are two options available to the procedure writer at this point, [REP] and [TERM.] Table 3-3 describes these two options in detail.

```
Select F.S.C...                                                    INSERT

        5100  RESF  5205  5220  WIDE  8506        RUNE  EVAL  MEMC
                          MEM2  MEMI  MEME  MEM*  MEM/  MEM+  MEM-
        JMP   JMPZ  JMPT  JMPF  RPT   CALL        RUN   ASK+  ASK-
        DISP  HEAD  OPBR  IEEE  RSLT  MESS  DRAW  SET   CON   RNG
1.001    5100 2 8mV 3% 1GH
                                                   REP TERM

REPLACE: 5100 2     8mV   8mV   3%    1KH
ERROR: Nominal/Frequency Incompatible
```

Figure 3-20. CHNG Display With Errors

Table 3-3. CHNG Error Correction Options

OPTION	DESCRIPTION
REP.	This option is used to repeat the FSC selection and enter parameters via the Programmer Keyboard.
TERM.	This option is used to terminate the change. If the change did not generate an error, the line will be replaced by the one just entered. If an error occurred, the original line will not be replaced. The system then displays the Procedure Edit List with the highlighted line being the next line beyond the line that the procedure writer changed. If a line has been changed from an FSC that caused an evaluation to one that does not cause an evaluation and the next line(s) is an optional adjustment, the optional adjustment(s) will be automatically deleted.

EXIT FROM CHNG MODE

If the procedure writer should accidently enter the change mode, or if the FSC necessary for the desired change is not available, an error can be purposely entered and [TERM] pressed. This action causes the system to leave the procedure intact.

BACKUP Process

The [BACKUP] option files the procedure you are currently writing or editing. This should be done any time you wish to end the editing session.

GETTING THE BACKUP OPTION MENU

To begin the backup, the procedure writer must return to the Procedure Edit List. Refer to the description of [TERM] in Tables 3-2 and 3-3 for details on how to do this. The [BACKUP] display key appears along with the other options discussed previously. Once this display key is depressed, the system presents the display shown in Figure 3-21. This display remains during the time the system is updating the Backup File.

Figure 3-21. Update of the Backup File Display

The update process copies the active edit file to another internal Backup File. As soon as the system has completed this operation, the procedure writer is given the opportunity to choose the appropriate Backup option. The Backup Display is shown in Figure 3-22.

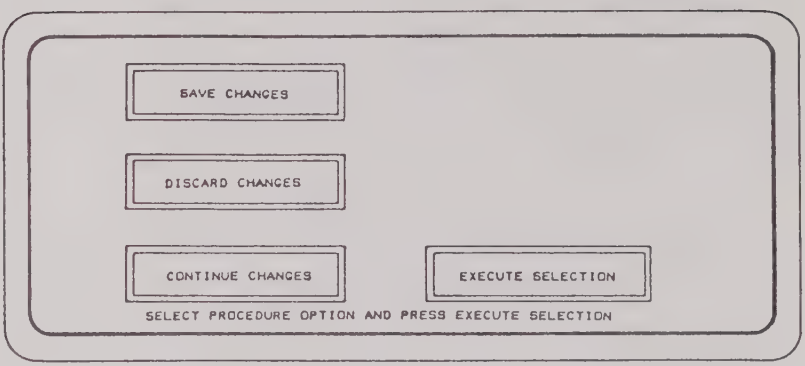

Figure 3-22. Backup Display

EXECUTE SELECTION

As soon as the procedure writer has pressed the appropriate display key to select any option, the [EXECUTE SELECTION] display key becomes active. Pressing [EXECUTE SELECTION] causes the previous selection to be performed.

DISCARD CHANGES

Selecting the Discard Changes option causes all edits in the present session to be ignored. This operation terminates the edit session and presents the System Directory. Remember, all changes made since the edit session was started are lost.

CONTINUE CHANGES

The Continue Changes option allows the procedure writer to continue the edit session. This option causes the system to return to the Procedure Edit List display with the highlighted line being the same one highlighted when [BACKUP] was used.

SAVE CHANGES

The Save Changes option terminates the edit session when the procedure is finished. The Save Current Version process works differently depending on which option was used to create the procedure. The possible actions are described in the paragraphs that follow.

New Procedures

When either the Write a New Procedure or Create New From Old Procedure options were used to create the procedure, and the 7411B system has been configured as a floppy disk based system, the display instructs the procedure writer to insert a procedure disk as shown in Figure 3-23.

When the display shown in Figure 3-23 appears, the procedure writer must insert into the drive the disk on which the procedure is to be saved. This disk must be formatted (see the Procedure Disk Formatting Appendix C). As soon as the disk is in the drive, the [ADV] (advance) display key should be pressed. If there is no disk present after [ADV] has been pressed, or if an abnormal disk error occurred when the system was trying to open a file, the display is repeated.

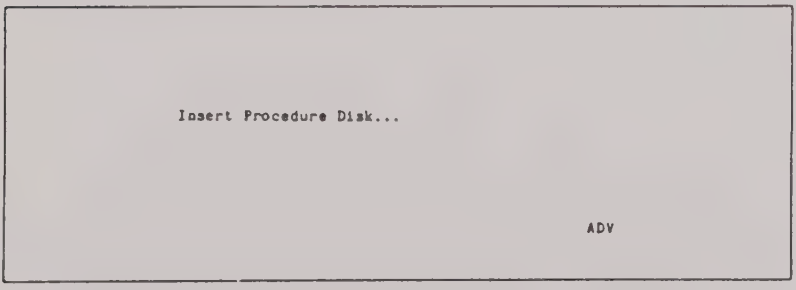

Figure 3-23. Backup Display During Save Current Version

Modified Procedures

If the edit session was done with the Modify Procedure option, and the 7411B system was configured as a floppy disk based system, the original disk should still be present. If the disk has been removed, the system will display the message shown in Figure 3-24.

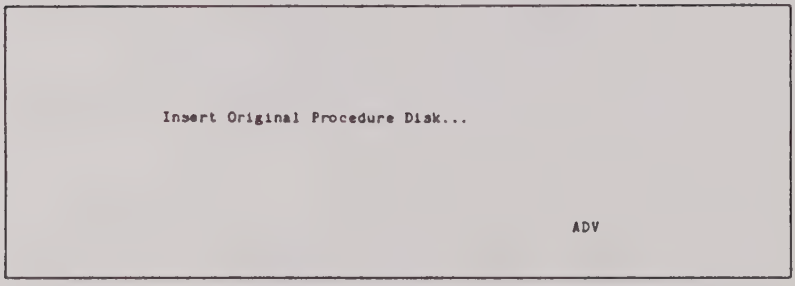

Figure 3-24. Backup Display for Modify a Procedure

The procedure writer must place the original procedure disk back in the drive and press [ADV]. Disks should never be changed for the Modify a Procedure option. If a change is made, the system will either repeat the display shown in Figure 3-24 or mistakenly write over another procedure (of the same file name) on the replacement disk.

TRANSFER OF THE PROCEDURE

If the procedure writer has completed the steps just described, the system begins the transfer of the procedure to the disk. The system display at this time is shown in Figure 3-25. At the end of the transfer the system returns to the System Directory display so that the procedure writer may write or modify another

procedure or select some other option. If any abnormal disk error occurs, the system will ask that another disk be inserted so that the transfer can be attempted again.

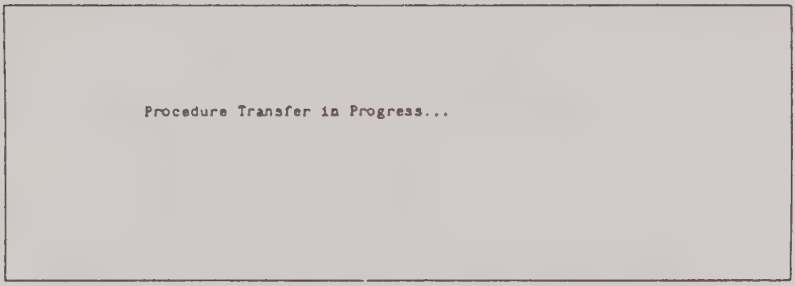

Figure 3-25. Procedure Transfer Display

NOT ENOUGH ROOM ON THE DISK

If there is not enough room on the disk for the procedure, the system displays the message shown in Figure 3-26. Pressing [ADV] causes the Insert Procedure Disk display to appear again. Refer to the 1722A System Guide for further information.

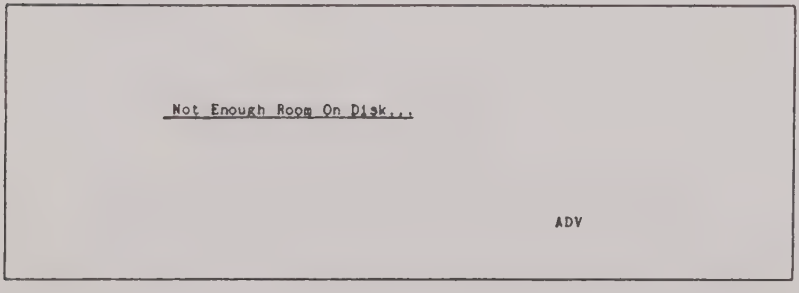

Figure 3-26. Not Enough Room Display

Section 4
Editing the Bar Code File

INTRODUCTION

The 7411B Calibration system has the capability to process bar code information that may be entered either manually or using a bar code reader. The bar code reader may be connected through an RS-232-C interface; refer to the Configuration manual for further information.

The Bar Code file contains information about the bar codes (or property number). Associated with each property number is the serial number of the instrument with that property number and the name of the appropriate procedure to calibrate that instrument. Editing the Bar Code file is what you do whenever you add, delete, or change property numbers or any other data in the Bar Code file.

After you select [EDIT BAR CODE FILE] in the System Directory, the display appears as shown in Figure 4-1.

The two possible actions in this menu are either adding an entry to the Bar Code file or deleting an entry from the Bar Code file. In either case, all three pieces of information must be entered (bar code or property number, serial number, and procedure name.)

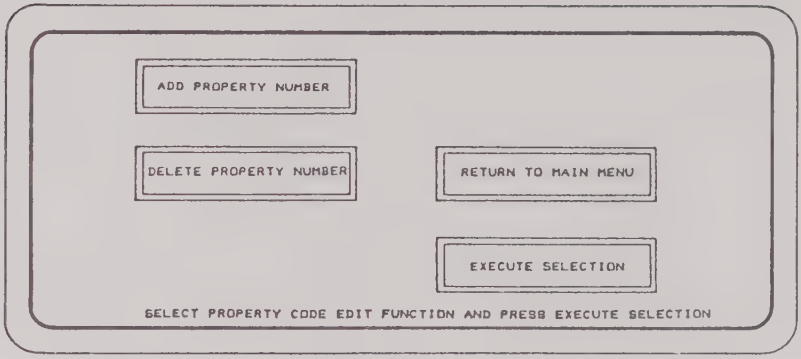
ADD PROPERTY NUMBER
DELETE PROPERTY NUMBER
RETURN TO MAIN MENU
EXECUTE SELECTION
SELECT PROPERTY CODE EDIT FUNCTION AND PRESS EXECUTE SELECTION

Figure 4-1. Bar Code File Edit Menu

ADD PROPERTY NUMBER OPTION ---1

After you selecting ADD PROPERTY NUMBER, followed by touching the EXECUTE SELECTION display key, the 1722A displays an alphanumeric keyboard as in Figure 4-2. From this point, you proceed to enter the property code, the serial number, and the name of the appropriate procedure as described in the following paragraphs.

Property Code Number: _____

0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z				
.	,	:	;	/	$	%	+	-	*
DELT		CASE		SPACE			ENTR		

Figure 4-2. Keyboard Display for Entering Property Code

Entering the Bar Code

With the Keyboard Display for Entering Property Code showing on the display, enter the property code in any one of the following three ways:

1. Enter the property code by touching the appropriate keys on the display and terminate the entry by pressing the ENTR display key.

2. If the 1722A keyboard is installed, enter the property code of the instrument by typing it on the keyboard followed by the RETURN key.

3. Use the bar code reader to read the bar code of the instrument.

Entering the Serial Number

After successfully entering the property code, you will be prompted for the serial number of the instrument and another alphanumeric keyboard is displayed. Enter the serial number of the instrument (UUT) in one of the two following ways:

1. Enter the serial number of the instrument, by touching the appropriate keys on the touch-sensitive screen, followed by the ENTR display key.

2. Or if the 1722A keyboard is installed, enter the serial number of the instrument by typing it on the keyboard followed by the RETURN key.

After completion of the entry of the property code and serial number, the 7411B system verifies that the same property code does not already exist in the Bar Code file. If it does exist, you will be prompted to overwrite (YES) or cancel your entry (NO). During the search for an existing property number (which can take

30 seconds to minutes for large files), the 7411B system displays a message that reads: "Checking for existing identical property number."

NOTE

You may also use the bar code reader to read the serial number if it is in the bar code form on the UUT.

Entering the Appropriate Calibration Procedure

You now need to select a calibration procedure for the Bar Code file entry from the existing procedures on the system. If your system was configured as a floppy disk based system you will be prompted to insert the disk on which the desired calibration procedure resides. A procedure selection menu will be displayed as in Figure 3-5 of the Procedure Writing Manual. You move the reverse video portion up or down using the UP and DOWN display keys and after the desired procedure is highlighted, you touch the SELECT display key on the screen.

DELETE PROPERTY NUMBER OPTION

After you selecting DELETE PROPERTY NUMBER, followed by touching the EXECUTE SELECTION display key, the 1722A displays an alphanumeric keyboard as in Figure 4-2.

With the Keyboard Display for Entering Property Code showing on the display, enter the property code in any one of the following three ways:

1. Enter the property code of the entry to delete by touching the appropriate keys on the display and terminate the entry by pressing the ENTR display key

2. If the 1722A keyboard is installed, enter the property code of the entry to delete by typing it on the keyboard followed by the RETURN key.

3. Use the bar code reader to read the bar code of the instrument whose entry you wish to delete.

After you enter the property code, the 7411B system verifies that the property number indeed exists in the Bar Code file. If the number does not exist, the 1722A displays "Bar Code Not Found" and you will be prompted to touch the display to continue.

If you have many property codes to delete, you may want to transfer the Bar Code file to a host system, edit the undesirable lines out and transfer the file back to the 7411B system. See "Bar Code File Format" for more information.

Note that it is not possible to delete a Bar Code file. It is possible to overwrite a Bar Code file. If you are trying to overwrite a Bar Code file (as with any other file in this system) you will be prompted for a confirmation.

BAR CODE FILE FORMAT

The Bar Code file is an ASCII file, with 3 fields per line. The fields are separated by comma's. The first field is the property number, the second field is the serial number and the third field is the procedure name.

It is possible to create or edit the Bar Code file on a different system, then transfer it to the 1722A in the 7411B system through its remote RS-232-C port. After editing you may transfer the Bar Code file again. While this method may be appropriate for adding a large number of property numbers, please note that the names

of the calibration procedures have to be exact, including all spaces. The characters, however, are not case sensitive. The last line in the Bar Code file is: "END,END,END".

RETURN TO MAIN MENU OPTION

While in the Edit Bar Code File menu you may decide not to make any changes after all. You touch the [RETURN TO MAIN MENU] and [EXECUTE SELECTION] display keys to return to the main System Directory.

BACKING UP THE BAR CODE FILE

If you have a hard disk system, you should keep a copy of the bar code file on a floppy disk.

In the event of a disk crash occur, the bar code file may be lost. Without the back-up copy on the floppy disk, you might have to re-enter the data, which can be very time consuming.

Section 5
FSC Descriptions

INTRODUCTION

This section describes each FSC in detail. To use the information presented in this section, it is necessary that you understand the information presented in Sections 1 and 2.

The FSC descriptions are listed alphanumerically, following the general descriptions of the three types of FSCs.

WHAT IS AN FSC?

An FSC (Function Selection Code) is a mnemonic in the calibration procedure language that informs the system of the task requested by the procedure writer. For example, the 5100 FSC informs the system to obtain a stimulus output from the Fluke 5100B Calibrator, while the DISP FSC informs the system that you wish to display a message to the operator during a calibration procedure.

There are three types of FSCs: Evaluation, Message, and Transparent.

EVALUATION FSCs

Evaluation FSCs enable you to test a UUT and generate a pass/fail result for each test. The following is a list

of the Evaluation FSCs for the 7411B System, including a brief description of each:

- 278 Voltage Stimulus
- M278 Voltage Stimulus
- 1953 Time, Frequency, and Ratio Measurement
- 2500 Current Stimulus
- 5001 Voltage, Current Stimulus
- 5100 Voltage, Current Stimulus
- 5200 Voltage Stimulus
- 5205 Voltage Stimulus (Optional)
- 5220 Current Stimulus (Optional)
- 5440 Voltage Stimulus
- 5450 Ohms Stimulus
- 6011 Voltage Stimulus
- 6060 Voltage Stimulus
- M606 Modulation Stimulus
- 6071 Voltage Stimulus
- 8505 Voltage, Current, Ohms Measurement
- 8506 Voltage, Current, Ohms Measurement
- 8520 Voltage, Conductance, Resistance Measurement
- DLVP Current Load
- EVAL Operator Evaluation
- MEMC Memory Comparison Evaluation
- MGEN Modulation or Sweep
- RESF Fixed Resistance Stimulus
- RESV Variable Resistance (7405A TI Panel)
- RUNE Run a BASIC Program that Produces an Evaluation
- WIDE Voltage Stimulus

MESSAGE FSCs

Message FSCs are used primarily to present calibration instructions (e.g., Set Switch S1 to ON) or other information to the operator. This information will be displayed on the screen of the Controller during the calibration procedure. The following is a list of the Message FSCs for the 7411B, including a brief description of each:

- CON Specify a Connection
- DISP Display a Message to the OPERATOR
- DRAW Define a Graphic Representation of the UUT
- HEAD Heading Message
- IEEE IEEE-488 Bus Data Message
- MEMI Memory Insert Message (into MEM)
- MEM2 Alter Value of MEM2 (16-character Message)
- MESS Message for EVAL, Measurement Setup, or Stimulus Test
- OPBR Operator Branch Message (YES = +1 in MEM1, NO = -1)
- PORT Transfer of Data Through RS 232C Port
- RNG Specify a Range
- RSLT Result Insert Message
- SET Generate a List of Settings for UUT Setup

TRANSPARENT FSCs

Transparent FSCs are called transparent because their action is transparent or invisible to the operator. Since these FSCs work unnoticed by the operator, there is no operator interaction. The following is a list of Transparent FSCs for the 7411B, including a brief description of each:

- ASK+ Automatic Messages and Choices On
- ASK- Automatic Messages and Choices Off
- CALL Call a Subroutine
- JMP Jump Unconditionally or on PASS or FAIL
- JMPF Jump on Negative in MEM1 or Instrument NOT selected
- JMPT Jump on Positive in MEM1 or Instrument selected
- JMPZ Jump on Zero in MEM1
- MCAL Programming Special Functions of Tektronix CG 5001AF
- MEME Memory Exchange
- MEM+ Memory Add

- MEM- Memory Subtract
- MEM* Memory Multiply
- MEM/ Memory Divide
- RPT Repeat Last Test (jump back to xxx.001)
- RUN Run a BASIC Program
- RUNE Run a BASIC Program with PASS/FAIL Evaluation

DESCRIPTION

The 278 FSC programs the Wavetek 278 Synthesized Function Generator to provide AC volts (10mHz to 10MHz) sine, triangle, or square-wave stimulus. An example of the 278 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	278	100	2MH	1%	.3VP	-D	SI		

PARAMETERS

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range per division> R

After the line is verified, the R disappears.

1. RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

2. If MOD2 is -D, the system specifies the range without respect to /Divisions in the automatic message.

3. If R is entered with no <range per division > data, no automatic range message will occur and MOD2 must be -D.

4. If AR is specified, the automatic range message will be 'Autorange' and MOD2 must be -D.

5. -D is automatically specified if the range is blank or autorange.

NOMINAL

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 278 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<Nominal> <prefix> V or VP or D or H or T

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M or g followed by a V (Volts) VP (volts peak to peak) or D (DBm into 50 ohms), H (frequency in Hz) or T (time in seconds). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	M 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

a. 5mV to 5V VP (peak)

b. 3.535mV to 3.535V V (rms)

c. -33.010D to +26.990D

d. 10mH to 10MH

e. 0.1S to 100S

- The nominal field may contain up to 14 characters.
- A nominal of * resets the 278. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.
- If the nominal is specified as T or H, the frequency is slewed; otherwise, the slew parameter is amplitude.
- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
< % of nominal> %	This tolerance is the percent of the nominal value.
< % of range> /	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.

<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units> U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- Percentage of range (% of range) or ppm of range are not allowed when the range is blank or autorange (AR).
- When the NOMINAL is specified in D (for dBm), nominal units (U) should be used in the TOLERANCE field. This rule will avoid confusion due to absolute tolerance differences in dB specifications.

MOD1

Specifies the stimulus frequency or amplitude. MOD1 entered as:

<frequency or amplitude><prefix> V or VP or T or H or D

The prefixes may be: p, n, u, m, K, M, or G. There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	M 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including the prefix and units (V, VP, T, H, or D).

- If the nominal is in amplitude (V, VP, or D), then MOD1 must specify the frequency. If the nominal is in frequency (T or H), then MOD1 must specify the amplitude.

- The frequency/amplitude restrictions as stated in the nominal value section apply to MOD1 as well, except that MOD1 must be greater than or equal to 100 kHz.

MOD2

Specifies the mode of the automatic range and slew message.

No Entry The automatic range message is specified in units of V or dBm or Hz or Sec/Division. The automatic slew message is specified in divisions.

-D The automatic range message is specified in units of V or dBm or Hz or Sec. The automatic slew message is expressed in nominal units rather than divisions.

o If the range is R or AR, MOD2 is automatically assigned as -D. If the test is a Setup (S in MOD4), -D is not used.

MOD3

Specifies the function (waveform) output of the 278

ENTRY	OUTPUT SPECIFIED
1.	SI specifies sine wave output
2.	TI specifies triangle wave output
3.	SQ specifies square wave output
4.	SC specifies square wave output 180^{o} out of phase with SYNC out

MOD4

Specifies the general mode of the test. There are four options:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No

C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another 278 Setup test or until a results-generating FSC is completed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C — Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. Not used, the FUNC output is always calibrated for a 50 ohm load.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 278 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections.

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is

asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup test of if the range is just R. If the nominal value is an amplitude, the range message is:

Set UUT [MEM2] To The --V or dBm/Division Range ...

- If the nominal value is a frequency or time, the range message is:

Set UUT [MEM2] To The --Sec or Hz/Division Range ...

- Note that MEM2 may be assigned (e.g. as 'Left Time Base' or 'Chan 2 Vertical Amplifier' prior to implementation of the 278 FSC. The assignment of MEM2 is used to make the messages more specific of to pass a parameter to a subprocedure for performing a test on two identical channels with one subprocedure. If MOD2 is -D, the '/Division' is not presented in this message.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message. If the nominal is an amplitude, the slew message is:

Adjust System Stimulus for A UUT Vertical Reading Of -- Divisions ...

- If the nominal specifies a frequency (or time), the slew message is:

Adjust System Stimulus for A UUT Horizontal Reading Of -- Divisions ...

- The number of divisions are computed from the range and nominal values. If MOD2 is -D, the slew message is:

Adjust System Stimulus for A UUT Reading Of --
V or Hz or Sed or dBm ...

ADDITIONAL 278 CAPABILITIES: The 278 FSC may be preceded by the M278 FSC if the desired stimulus requires parameters that aren't available in the 278 FSC.

USE OF MEM AS NOMINAL: When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 278.

DESCRIPTION

The M278 FSC allows programming the Wavetek 278 Synthesized Function Generator using parameters not provided in the basic 278 FSC. The M278 FSC sets up a string of device dependent IEEE commands to be sent to the 278 on the next occurrence of the 278 FSC. An example of the M278 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	M278		SIE-3	NO5E-3					

PARAMETERS

The following parameters apply to the M278 FSC.

Nominal, Tolerance, MOD1, MOD2, MOD3, MOD4 and CON

This area contains the string of Wavetek 278 device dependent programming characters and may also contain the following special constructs:

- [MEM] Uses the value of MEM.
- [MEM1] Uses the value of MEM1.
- [MEM2] Uses the value of MEM2.

Range

This parameter is not used.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the M278 FSC.

EXECUTION

The string of characters is sent to the Wavetek 278 after the commands generated by the 278 FSC but before enabling the output and executing the setup. The M278 characters will be sent to each occurrence of the 278 FSC until they are disabled with a blank M278 FSC, returning the Wavetek 278 programming to the 278 default parameters.

AUTOMATIC MESSAGES

Any parameter programmed with the M278 FSC will not appear in the messages generated by the 278 FSC.

VERIFICATION

Because the M278 Procedure Generator/Editor cannot be aware of the 278 amplitude or frequency, a complete verification of the parameter entry cannot be automatically performed. Because of this, the procedure writer should be cognizant of the parameters being used when this FSC is selected.

DESCRIPTION

This FSC programs the 2500EP Transconductance Amplifier to provide DC Current (-10 Amps to +10 Amps) and AC Current (0 Amps to 7 Amps from 100Hz-10KHz) stimulus. An example of the 2500 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	2500	1	1.1A	.1%		1000H			2W

PARAMETERS

The following parameters apply to the 2500 FSC.

NOMINAL

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 2500 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered as:

<Nominal><prefix>A

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, k, or g followed by a A (Amps). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m or M	m 10^{-3}
k or K	K 10^{3}
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

a. -10 to +10 amps DC.

b. 0 to 7 amps AC (10 Hz- 5 KHz)

- The nominal and its units may contain up to 14 characters.

- A nominal of * sets the 2500 to standby. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.

- If just nominal units are entered (e.g., mA), the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range per division > data, no automatic range message will occur.

- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

- < % of nominal> % This tolerance is the percent of the nominal value.

- < % of range> / This tolerance is the percent of range as entered in the RANGE field.

- <ppm of nominal> P% This tolerance is in ppm of the nominal value.

- <ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

- <absolute units > U Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance if inferred.

- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.

- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.

- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.

- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

Specifies the stimulus frequency as:

<frequency> <prefix>H

The prefix may be: p, u, none, K, M, or G. There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
k or K	K 10^{3}
M	M 10^{6}
g or G	G 10^{9}

The MOD1 entry may be up to 14 characters in length. Allowable values are 100 Hz through 10 KHz.

MOD2

MOD2 is not used.

MOD3

MOD3 is not used.

MOD4

Specifies the general mode of the test. There are four options as summarized below:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
No Entry	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated,

and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another 2500 Setup test or until a results-generating FSC is completed.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C — Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. This field specifies the UUT connection to the Test Interface Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection.

MISCELLANEOUS

The following paragraphs contain miscellaneous information about the 2500 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections and press the ADV display key. If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

Programs the Fluke 1953A Counter-Timer to provide frequency measurement (up to 125 MHz), time measurement (up to 100 seconds), and ratio measurement (up to 10^9:1).

Example:

```
STEP   FSC   RANGE NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON
38.004 1953   A     1MH     .00025U    2V                A
```

PARAMETERS

The following parameters apply to the 1953 FSC.

Nominal

Nominal value for test. This parameter is the value that the 1953A is to measure. It is entered by:

<nominal><prefix><units>

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by units T (seconds) or H (Hertz). There is an automatic translation of prefixes to allow the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

The units of Nominal, in conjunction with the Connection, specify the function the 1953A will perform.

Nominal Units	Connection	1953 Function
H	Input A	Frequency
H	Input B	Frequency Ratio
T	Input A	Period
T	Input B	Time Difference

ALLOWED VALUES

The allowed Nominal values are:

Frequency: up to 125 MH (but not 0 H)

Ratio: up to 1 GH (109:1)

Period: up to 99999.9999 mT (< 100 seconds)

Difference: up to 32T (< 32 seconds)

- The nominal field may contain up to 14 characters.
- An entry of * in the Nominal resets the 1953 to standby. This is a Setup test, so MOD4 will automatically be assigned as S. If a <RETURN> with no data is entered as the 1953 parameter entry, an * and S are assigned.

- If just nominal units are entered (e.g., T), the nominal will be that of MEM plus the units specified.

Range

Range specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range per division>R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range per division> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters long, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TEST TYPE
<% of nominal>%	This tolerance is the percent of the nominal value.
<% of range>/	This tolerance is the percent of range as entered in the RANGE field.

<ppm of nominal> P% This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units>U Units are the same as those used in the nominal field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

MOD1 specifies the amplitude of the stimulus. It is entered as:

<amplitude><prefix><units>

- The amplitude may be followed by <units> D (decibels) or V (volts). If D is specified, MOD2 is used to indicate the load.
- The prefixes may be: p, u, n, m, none, K, or G followed by D (decibels) or V (volts). There is an automatic translation of prefixes to allow the use of

upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m or M	m 10^{-3}
k or K	K 10^{3}
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including units. The allowable limits are:

  a. 100mV to 50V

  b. -6.99 dBm to 46.99 dBm @ 50 ohms

  c. -8.75 dBm to 45.23 @ 75 ohms

  d. -14.77 dBm to 39.21 @ 300 ohms

  e. -17.78 dBm to 36.20 @ 600 ohms

MOD2

MOD2 specifies the load impedance if the amplitude is in dBm units. If the amplitude is in dBm units and no MOD2 is entered, the default value of 5Z (50 ohms) is automatically entered. The allowed values are 50 ohms, 75 ohms, and 600 ohms. The entry is done by:

ENTRY:	IMPEDANCE IS:
5Z	50 ohms
7Z	75 ohms
3Z	300 ohms
6Z	600 ohms

MOD3

MOD3 is used to specify the trigger slope and coupling mode for each input channel of the 1953. This is entered in the form:

<B input><A input>F

Once the line is verified, the F disappears.

The number entered for the B input or A input is:

Input	Slope/Coupling
3	-AC
2	-DC
1	+AC
0	+DC

- If nothing is entered, both channels are set to +DC. An example of the use of MOD3 is:

  Enter: 21F

  The 1953A is programmed to:

  a. A input is ac coupled and triggers on + slope

  b. b input is dc coupled and triggers on - slope

MOD4

MOD4 specifies the general mode of the test. There are four options, summarized as follows:

ENTRY	MEM	MEM1	RESULTS
(blank)	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON

Connection. This field specifies the UUT connection to the TI panel. If nothing is entered, the system will insert an A for input A. It is possible to specify A for frequency input A, or B for frequency input A and B. Remember that the Connection is used in conjunction with the Nominal to determine the function performed.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 1953 FSC.

Memory Allocation

Normally the measurement is saved in MEM1. If MOD4 is N (Nominal Set), MEM contains the measurement. The value is saved in the nominal units.

Automatic Messages

The following messages will be automatically displayed by the system unless they have been purposely defeated (see the ASK+ and ASK- FSC Description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make disconnections and connections, then press the ADV display key.

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup test.

- The operator is asked: 'Set UUT to Source (nominal)' and 'Then Set to Operate'. Following this, the operator may then press the ADV display key. This message does not appear during a Setup test.

- If it is a Setup test, any pending MESS lines (see the 'MESS' FSC description) are displayed, followed by 'Present Measurement Is...', which is continually updated.

- The operator is asked to take the UUT out of the operate mode and press the ADV display key. This message does not appear during a Setup test.

DESCRIPTION

The 5001 FSC programs the Tektronix CG5001 Programmable Calibration Generator to provide the following:

1. Voltage (to check vertical and horizontal gain).

2. Current (to check the accuracy of current probes and amplifiers).

3. Edge (to check the transient response of amplifiers and attenuator networks).

4. Markers (to check the timing accuracy of horizontal sweep rates up to 10 ns/div).

5. Slewed Edge (to check the timing accuracy of horizontal sweep rates up to 0.4 ns/div).

6. Comparator Tests (to check the accuracy of calibrator outputs).

The following is an example of the 5001 FSC:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
14.009	5001	5	20mVP	3%		1KH			

PARAMETERS

Nominal

specifies the nominal value for the test. if the test is a setup (S in mod4) then the nominal is the value to which the 5001 will be programmed; otherwise, it is the

stimulus value prior to slewing the stimulus and the reading of the uut after the stimulus is slewed. the nominal value is entered by:

<nominal><prefix><units>

- The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by units: VP (volts peak to peak), H (frequency in Hz), A (amps), or T (time in seconds). Test specification is assigned in MOD3. The types of tests are:

Current:	Nominal units are A; MOD3 is blank.
Voltage:	Nominal units are VP; MOD3 is blank.
Edge:	Nominal units are VP; MOD3 is E.
Slewed Edge:	Nominal units are T or H; MOD3 is blank with frequency <10nT.
Markers:	Nominal units are T or H; MOD3 is blank with frequency >=10nT.
Comparator:	Nominal units are VP; MOD3 is CO

- The threshold for slewed edge and markers mode switch-over may be modified by the MCAL FSC.

- There is an automatic translation of units that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

o The allowed combinations of nominal values and modifier MOD 1 are defined as follows:

CURRENT	MOD1
1 mA-100 mA, peak	DC, 10H-1MH (in decade steps)
VOLTAGE	
40 uVP-60 mVP	10H-10kH (in decade steps)
100 mVP-10 VP	DC, 10H-100kH (in decade steps)
12 VP-200 VP	DC, 10H-10kH (in decade steps)

The range is 40 uVP-5 VP into 1 megohm or 50 ohms, and >5 VP into 1 megohm only.

EDGE	
+/-20 mVP-1 VP	10H-1 MH (in decade steps)
+/-1.1 VP	100H-100 kH (in decade steps)
1.2 VP-100 VP	10H-100kH (in decade steps)

Voltages are peak into 50 ohms (no 1 megohm output except >1.2 VP, in which case only 1 megohm output is available).

SLEWED EDGE

.4nT, .5nT-10nT in in 1, 2, 5, sequence (may also be specified in H)	Not Used (amplitude is 1V minimum into 50 ohms)

Note that the upper threshold may vary from 10nT to 100nT using the MCAL FSC. Default is 10nT.

MARKERS

10nT-5T, in 1,2,5 sequence (May also be specified in H)	Not Used (amplitude is 1V minimum into 50 ohms)

Note that the lower threshold may vary from 10nT to 200nT using the MCAL FSC. Default is 10nT.

COMPARATOR

100 mVP-100 VP	DC, 10H-1MH (in decade steps)

The connection field specifies whether the output is into 50 ohms or 1 megohm.

- The nominal field may contain up to 14 characters.
- A nominal of * sets the 5001 to standby. This test is a Setup, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, a * and S are assigned.
- If just nominal units are entered (e.g., mVP), the nominal will be that of MEM plus the units specified.
- For amplitude specification, the sequence of allowed nominals is: 1, 1.2, 1.5, 1.6, 2, 2.5, 3, 4, 5, 6, 8, or 10.

9. For specification of dc, MOD1 is simply not entered.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range per division>R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If MOD2 is -D, the system specifies the range without respect to /Divisions in the automatic message.
- If R is entered with no <range per division> data, no automatic range message will occur and MOD2 must be -D.
- If AR is specified, the automatic range message will be 'Autorange' and MOD2 must be -D.
- -D is automatically specified if the range is blank or autorange.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters long, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	This tolerance is the percent of the final applied stimulus (the actual 7410A source value).
<% of range>/	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

Specifies the stimulus frequency as:

<frequency><prefix><units>

- The units may be T or H
- The prefixes may be p, n, u, m, K, or G. There is an automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters long, including the units and type (T or H).
- The frequency/amplitude restrictions as stated in the nominal value section of apply to MOD1 as well.

MOD2

Specifies the mode of the automatic range and slew message.

- No Entry: The automatic range message is specified in units of VP or H or T/Division. The automatic slew message is specified in Divisions.

- -D: The automatic range message is specified in units of A or VP or H or T. The automatic slew message is expressed in nominal units rather than divisions.

- If the range is entered as R or AR, or if the test is a Setup (S in MOD4), MOD2 is automatically -D.

MOD3

Specifies the type of test to perform. The alternatives are defined as follows:

FUNCTION	MOD3	NOMINAL
Current	Blank	A
Voltage	Blank	VP
Edge	E	VP
Slewed Edge	Blank	T or H
Markers	Blank	T or H
Comparator	CO	VP

MOD4

Specifies the general mode of the test. There are four options (summarized as follows):

ENTRY	MEM	MEM1	RESULTS
(blank)	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No

C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

If no nominal is specified in the 5001 entry, then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may

be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON

Connection. Specifies the impedance of the UUT. The possibilities are:

ENTRY	IMPEDANCE SPECIFICATION
(blank)	The system output is calibrated for a UUT impedance of 1 megohm or greater. The connection field must be blank for edge >1.1VP, voltage >5VP, current, slewed edge, and markers.
L	The system output is calibrated for a UUT impedance of 50 ohms. The connection must be L for edges <= 1.1VP. If the operator does not enter L in these cases, it is automatically entered.

- The connection may be either L or blank for comparator tests and voltage <5VP.
- The procedure writer must produce a message to the operator requesting 50-ohm termination at the UUT input if L is specified in CONNECTION (for example, a 50-ohm feed-through in line to a high

impedance oscilloscope or a high frequency oscilloscope that has an intrinsic 50-ohm input impedance).

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5001 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will be automatically displayed by the system unless they are purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI (Test Interface) panel, the operator is asked to make the required connections and disconnections. The stimulus originates at the Calibrator Output port of the Test Interface Panel. If MOD3 is CO for comparator tests, the connection to the UUT is via the Comparator Head; otherwise, the Pulse Head is connected to the UUT. The trigger output connection is automatically produced unless the MCAL FSC is used to deactivate the trigger output. A possible connection message is:

  Connect UUT to TI Panel: Calibrator Output With Pulse Head

- If the UUT range has changed from the last instrument-oriented or RNG FSC, the operator is asked to set the new range and then press the ADV display key. A range message is not produced for a Setup test or if the range is just R. If the nominal value is an amplitude, the range message is:

  Set UUT [MEM2] To The -- A or V/Division Range...

- If the nominal value is a frequency or time, the range message is:

  Set UUT [MEM2] To The -- Sec or Hz/Division Range..

- Note that MEM2 may be assigned (e.g., as 'Left Time Base' or 'Chan 2 Vertical') prior to implementation of the 5001 FSC. The assignment of MEM2 is used to make the messages more specific or to pass a parameter to a subprocedure for performing a test on two identical channels with one subprocedure. If the Connection is -D, the '/Division' is not presented in the message.

- If there is a pending MESS (see MESS FSC), it is displayed and is followed by the slew message. A Setup test produces no MESS lines or slew message. If the nominal is an amplitude, the slew message is:

  Adjust System Stimulus For A UUT Vertical Reading C
  Divisions...

- If the nominal specifies a frequency (or time), the slew message is:

  Adjust System Stimulus For A UUT Horizontal Reading
  Divisions...

- The number of divisions is computed from the range and nominal values. If MOD2 is -D, the message is:

  Adjust System Stimulus For a UUT Reading Of --
  Hz or Sec or A or V...

USE OF MEM AS NOMINAL

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot fully verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the CG5001.

DESCRIPTION

The 5100 FSC instructs the system to request a voltage or current stimulus from the 5100B Calibrator. An example of the 5100 FSC is shown below:

```
STEP    FSC    RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
1.006   5100   200   190mV   .13U                       2W
```

PARAMETERS

The following parameters apply to the 5100 FSC.

Nominal

Specifies the Nominal value of the stimulus output for the test. If the test is a Setup (MOD4=S) then the Nominal value is the programmed stimulus output of the 5100B Calibrator; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal is entered as:

<nominal><prefix><units>

ALLOWED VALUES

The values allowed for nominal are:

Volts, dc

-1100V to +1100V
-700V to +700V (7405A system only)

Volts, ac

1 uV to 19.9999V @ 50 Hz to 50 kHz
20V to 110V @ 50 Hz to 20 kHz
110V to 1100V @ 50 Hz to 1 kHz

Decibels (dBm into 600 ohms)

-117 dBm to 28.239 dBm @ 50 Hz to 50 kHz
-117 dBm to 43.046 dBm @ 50 Hz to 20 kHz
-117 dBm to 63.046 dBm @ 50 Hz to 1 kHz

Amps, dc

10 uA to 1.99999A and -10 uA to -1.99999A

Amps, ac

10 uA to 1.99999A @ 50 Hz to 5 kHz

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

VOLTS	AMPS	DECIBELS	MULTIPLIER
V	A	D	1
pV or PV	pA or PA		10^{-12}
nV or NV	nA or NA		10^{-9}
uV or UV	uA or UA		10^{-6}
mV or MV	mA or MA		10^{-3}
kV or KV	kA or KA		10^{3}
gV or GV	gA or GA		10^{9}

- A maximum of 14 characters is allowed for the Nominal field.

- A Nominal value of * (asterisk) sets the 5100B to Standby. This causes a Setup test, and MOD4 will automatically be set to S.

- If a <RETURN> is entered, with no additional data, an * (asterisk) is implied.

- If units are entered without a Nominal value (e.g., mV), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal Value. The UUT range is entered as:

<range>R

- After the line has been read and verified by the system, the R is removed (from the procedure record).

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the nominal value.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Tolerance as a absolute value (units are the same as those used for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.

A tolerance is not allowed with a Setup test. Therefore, tolerance is not allowed in an indented adjustment.

- Percentage of range (% of range) or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Specifies the frequency of the Nominal value stimulus (for ac tests). MOD1 is entered as:

<frequency><prefix> H

The values allowed for frequency are:

FREQUENCY	VOLTAGE
50 Hz to 1 kHz	1 uV to 1100V
50 Hz to 20 kHz	1 uV to 110V
50 Hz to 50 kHz	1 uV to 19.9999V
50 Hz to 5 kHz	10 uA to 1.99999A

The 7411B interprets MOD1 prefixes as follows:

UNITS	MULTIPLIER
none	1
p or P	10^{-12}
n or N	10^{-9}
u or U	10^{-6}
k or K	10^{3}
m or M	10^{6}
g or G	10^{9}

- A maximum of 14 characters is allowed for the MOD1 field.

- The frequency allows single-digit resolution. For example, 50H or 60H are allowed, but 55H is not.

MOD2

Allows you to specify the divider feature of the 5100B Calibrator.

Select divider override in the following situations:

DC VOLTS	AC VOLTS	REASON
Any high burden meter voltage < 2V; 4W connection possible	Any high burden meter voltage < 200 mV; 4W connection possible	Source impedance is normally 50 Ohms in these ranges.
	Voltage > 12.5 mV and voltage < 20 mV; bandwidth UUT < 1MHz; highest accuracy	System noise does not reduce calibration accuracy for UUT's with bandwidths < 1 MHz. Higher accuracy is obtained without external divider.

See the information under MISCELLANEOUS in this section for more information.

MOD3

This field is used to specify accuracy enhancement. In DC volts, accuracy enhancement applies to the full range of allowed values. In AC volts, accuracy enhancement can only be used between 12.5 mV and 600V if the external divider is not used. If the external divider is used, accuracy enhancement can be selected to improve the accuracy at the input of the external divider.

Accuracy enhancement is specified automatically where the accuracy of the UUT requires the highest accuracy of the calibration system.

FUNCTION	NOMINAL VOLTAGE	UUT Tolerance	Other
dc volts	> 0.02 V	< 0.02%	
ac volts	> 0.2 V	< 0.2 %	For 7405A system: freq <10 kHz

Automatic insertion is prevented by entering -E during specifying the calibration step.

See the information under MISCELLANEOUS for more information.

MOD4

Specifies the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Evaluation test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System Stimulus is stored in MEM1. The stimulus value in units of the Nominal and the MOD1 is printed in the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE fields for a Setup test. The only automatic

message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.

N — Nominal Set test (without evaluation). Allows you to slew the nominal setting, with the final Nominal value saved in MEM. No results are generated. The next procedure line is executed immediately. This test may be used for initializing frequency response tests in conjunction with Compare tests.

C — Comparison test. An evaluation test except that the system stimulus is compared to MEM instead of the Nominal value. Results are generated, and the system stimulus value is saved in MEM1. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests.

CON

Connection. This field specifies the UUT connection. If nothing is entered, the system will automatically insert 2W. If V ac is specified, the stimulus is less than 20mV, and MOD2 is not the letter O, the system will solicit a connection to the terminals using the external AC Divider. Four-wire stimulus is not applicable in some configurations, as defined in the notes that follow:

1. V dc under 2V dc unless MOD2 is O
2. V ac under 200 mV ac
3. Current stimulus

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5100 FSC.

Memory Allocation

The last system stimulus of the test is normally saved (in Nominal units) in MEM1. If MOD4 is N, it is saved in MEM. If no Nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection the operator is asked to make the required changes and press [ADV].
- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV]. A range message is not produced for a Setup.
- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

Divider Override

The divider override capability built into the 5100B was designed to calibrate high-burden dc and ac voltmeters. Typically, the accuracy of high-burden meters is not high, and the accuracy of the 5100B is limited in divider override mode.

The resistive divider in 5100B is used in the 20 mV, 200 mV and 2V dc volts ranges. Floor specifications ar improved (thermal EMFs and offsets) by using the divider. The output impedance of the divider is 50 ohms.

The resistive divider in the 5100B is also used in the 20 mV and 200 mV ac volts ranges. Also in this case floor specifications are improved. Again the output impedance of the divider is 50 ohms.

The 20 mV ac volts range of the 5100B in the calibration system environment contains a substantial amount of noise energy between 1 MHz and 10 MHz. This noise becomes apparent when calibrating sensitive wideband (> 1 MHz) ac voltmeters. An external 1000:1 external divider is supplied with the 7411A calibration system to calibrate the most sensitive range for this type of meter. In addition, the 1000:1 divider can be used with the 2V ac range of the 5100B, providing an additional 200 uV to 2 mV ac range, with a source impedance of 50 ohms.

Accuracy Enhancement

The MOD3 field in the 5100 FSC is used to specify system accuracy enhancement. The accuracy of the voltmeter in the calibration system is used to provide the same level of system accuracy, which is higher then the accuracy of the 5100B.

In case of a 7405A calibration system, the 8505A voltmeter is used to enhance the accuracy of the 5100B. The Test Interface panel provides for the necessary interconnects. The enhancement of the AC volts accuracy in a 7405A system is rather unique; refer to the maintenance manual of the 7405A for more information.

In case of a 7404B system, the 8506A voltmeter is used for accuracy enhancement. The Y8404 cable provides the interconnect between 5100B and 8506A. The 8506A operates in the average enhanced accuracy mode.

Further Information for Accuracy Enhancement Operation

The method of operation depends on two options available to the procedure writer. In addition, a Setup test selection in MOD4 influences the method of enhancement according to the following table:

Field MOD3	Field MOD4	Operation
E or EF	-	1. Apply stimulus from the 5100, nominal value. 2. Adjust manually the stimulus so that the UUT reads nominal. 3. Read the adjusted output with the voltmeter, compare the result to the UUT nominal value, and generate the result.
E	S	1. Apply the stimulus. 2. Adjust the stimulus to the nominal based on a reading by the voltmeter. 3. The reading of the voltmeter is stored in MEM1. No further results are generated (Setup test).

NOTE:

To use the Setup test, the procedure writer may continue as follows:

a. Use the IEEE FSC to take a reading from the UUT to be placed in MEM.

b. Use the MEME FSC to exchange UUT actual in MEM and system actual in MEM1 to the correct locations for a compare.

c. Use the MEMC FSC to compare the system actual to the UUT actual and generate the results.

EF S

1. Apply the stimulus.

2. The voltmeter reads measures the stimulus of the 5100B, and stores the reading in MEM1.

NOTE:

To use the Setup test, the procedure writer may continue as follows:

a. Use the IEEE FSC to take a reading from the UUT, to be placed in MEM.

b. Use the MEME FSC to exchange UUT and system actual to the correct locations for a compare.

c. Use the MEMC FSC to compare the system actual to the UUT actual and generate the results.

Enhancement in the 20mV Range
Using the External 1000:1 Divider

In the 20mV range typically the external 1000:1 external divider is used to achieve the highest accuracy for wideband voltmeters. In this mode of operation, the output of the 5100B is enhanced by the voltmeter. The system accuracy in this range is therefore limited by the enhanced accuracy of the 5100B itself and the accuracy of the divider.

DESCRIPTION

This FSC programs the 5200 AC Calibrator in conjunction with the 5205A or 5215A Power Amplifier to provide AC Volts (100uV to 1200V) stimulus. An example of the 5200 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	5200	200	190MV	.1%		1000H			2W

PARAMETERS

The following parameters apply to the 5200 FSC.

NOMINAL

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 5200 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered as:

<Nominal><prefix>V

<Nominal> <prefix>D (Where 0 dB = 1mW in 600 Ohms)

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, k, or g followed by a V (Volts) or D (Decibels). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m or M	m 10^{-3}
k or K	K 10^{3}
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

- 100uV to 119.999V (10Hz-1.199 MHz) with volts-hertz product less than 1E7 for frequencies above 100 KHz.
- 120V to 1100V (10Hz-100KHz) (with 5205A or 5215A)
- 0.12V to 119.999V (4 Wire)
- -77.78D to 43.8D (10Hz-1.199MHz) (2 wire)
- -77.78D to 63.0D (100Hz-100KHz) (2 wire) (with 5205A or 5215A).
- -16.19D to 43.8D (4 Wire)

The nominal field may contain up to 14 characters.

A nominal of * sets the 5200 to standby. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.

If just nominal units are entered (e.g., mV), the nominal will be that of MEM plus the units specified.

RANGE

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

- After the line is verified, the R disappears.
- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range per division > data, no automatic range message will occur.
- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
< % of nominal> %	This tolerance is the percent of the nominal value.
< % of range> /	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units > U Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

Specifies the stimulus frequency as:

<frequency><prefix>H

The prefixes may be: p, u, none, K, M, or G. There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
k or K	K 10^{3}
M	M 10^{6}
g or G	G 10^{9}

ALLOWABLE VALUES

The MOD1 field may be up to 14 characters in length. Allowable values are:

- 10Hz-1.199MHz 100uV to 119.999V (Volts x Hertz < 1E7 above 83.33KHz)
- 10Hz-100KHz 120V-1100V

MOD2

MOD2 is not used.

MOD3

MOD3 is not used.

MOD4

Specifies the general mode of the test. There are four options:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes

S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another 5200 Setup test or until a results-generating FSC is completed. 5200 settling times will vary depending on nominal value requested.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances

are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C — Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. This field specifies the UUT connection to the Test Interface Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection to the 5200 Output Source terminals or 5215 Output terminals (for amplitudes greater than 120V). Four-wire stimulus is applicable only for nominal values from .12V to 120V.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5200 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and

  connections and press the ADV display key. If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

- If the 5200A-800 option is being used, the system stimulus is corrected by the information stored in the data table of the 5200A-800 option. The lower left side of the screen will show "ENHANCEMENT IN USE".

DESCRIPTION

The 5205 FSC instructs the system to request a voltage stimulus from the 5205A Power Amplifier Option, which it is assumed is driven by a 5100B. An example of the 5205 FSC is shown below:

```
STEP    FSC    RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
8.001   5205   1100  1000V   .7U                        2W
```

PARAMETERS

The following parameters apply to the 5205 FSC:

Nominal

Specifies the Nominal value of the stimulus output for the test. If the test is a Setup (MOD4=S) then the Nominal value is the programmed stimulus output of the 5205 Power Amplifier Option; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered as:

<nominal><prefix><units>

ALLOWED VALUES

The values allowed for nominal are:

Volts, dc

-1100V to +1100V

Volts, ac

20V to 1100V @ 50 Hz to 50 kHz

Decibels (dBm into 600 ohms)

28.239 dBm to 63.046 dBm @ 50 Hz to 50 kHz

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

VOLTS or	DECIBELS	MULTIPLIER
V or	D	value of integer
pV or PV		10^{-12}
nV or NV		10^{-9}
uV or UV		10^{-6}
mV or MV		10^{-3}
kV or KV		10^{3}
gV or GV		10^{9}
none		1

- A maximum of 14 characters is allowed for the Nominal field.
- A Nominal value of * (asterisk) sets the 5205A to Standby. This causes a Setup test, and MOD4 will automatically be set to S.
- If a <RETURN> is entered, with no additional data, an * (asterisk) is implied.
- If units are entered without a Nominal value (e.g., mV), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal Value. The UUT range is entered as:

<range>R

After the line has been read and verified by the system, the 'R' is removed (from the procedure record).

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the nominal value.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units>U Tolerance as an absolute value (units are same as for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is not allowed in an indented adjustment.
- Percentage of range (% of range) or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Specifies the frequency of the Nominal value stimulus (for ac tests). MOD1 is entered as:

<frequency><prefix>H

The values allowed for frequency are:

FREQUENCY	VOLTAGE
50 Hz to 50 kHz	20V to 1100V

The 7411B interprets MOD1 unit prefixes as follows:

UNITS	MULTIPLIER
none	1
p or P	10^{-12}
n or N	10^{-9}
u or U	10^{-6}
k or K	10^{3}
m or M	10^{6}
g or G	10^{9}

- A maximum of 14 characters is allowed for the MOD1 field.
- The frequency allows single-digit resolution. For example, 50H or 60H are allowed, but 55H is not.

MOD4

Specifies the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Evaluation test. The operator is asked to slew the Nominal value stimulus, and an evaluation is based on the final stimulus value. The resulting system stimulus is saved in MEM1. The stimulus value in units of the Nominal and the MOD1 setting is displayed at the lower left of the screen for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE

field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON

Allows you to specify UUT connections. The system will default to a two-wire connection (2W). No four-wire connection is available.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5205 FSC.

Memory Allocation

The last system stimulus of the test is normally saved (in Nominal units) in MEM1. If MOD4 is N, it is saved

in MEM. If no Nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection the operator is asked to make the required changes and press [ADV].

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV].

- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

The 5220 FSC instructs the system to request a dc or ac current stimulus from the 5220A Transconductance Amplifier. In order to obtain dc current stimulus, a 5100B Meter Calibrator or 5440A DC Calibrator must be configured in the system. In order to obtain ac current stimulus, a 5100B Meter Calibrator must be present in the system. To use the 5220A with the 5440A, use the 5440 FSC. The 5220 FSC assumes a 5100B in the system.

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
5220	2	1.9A		3%					2W

PARAMETERS

The following parameters apply to the 5220 FSC.

Nominal

Specifies the Nominal value of the stimulus output for the test. If the test is a Setup (MOD4=S), then the Nominal value is the programmed stimulus output of the 5220 Transconductance Amplifier; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered as:

<nominal><prefix> A

ALLOWED VALUES

The values allowed for nominal are:

Current, dc

-20A to 20A

Current, ac

2A to 20A @ 50 Hz to 5 kHz

ALLOWED PREFIXES

The 7411B interprets the unit prefix of the Nominal value as follows:

AMPS	MULTIPLIER
A	1
pA or PA	10^{-12}
nA or NA	10^{-9}
uA or UA	10^{-6}
mA or MA	10^{-3}
kA or KA	10^{3}
gA or GA	10^{9}

- A maximum of 14 characters is allowed for the Nominal field.
- A Nominal value of * (asterisk) sets the 5220A to Standby. This indicates a Setup test, and MOD4 will automatically be set to S.
- If a <RETURN> is entered, with no additional data, an * (asterisk) is implied.
- If units are entered without a Nominal value (e.g., A), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal Value. The UUT range is entered as:

<range>R

After the line has been read and verified by the system, the 'R' is removed (from the procedure record).

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the nominal value.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Tolerance as an absolute value (units are same as for for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is not allowed in an indented adjustment.
- Percentage of range (% of range) or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Specifies the frequency of the Nominal value stimulus (for ac tests). MOD1 is entered as:

<frequency><prefix>H

The values allowed for frequency are shown below:

FREQUENCY	VOLTAGE
50 Hz to 50 kHz	2A to 20A

The 7411B interprets MOD1 prefixes as follows:

UNITS	MULTIPLIER
none	1
p or P	10^{-12}
n or N	10^{-9}
u or U	10^{-6}

UNITS	MULTIPLIER
k or K	10^3
m or M	10^6
g or G	10^9

- A maximum of 14 characters is allowed for the frequency plus units.
- The frequency allows single-digit resolution. For example, 50H or 60H are allowed, but 55H is not.

MOD4

Specifies the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1.

The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON (Connection)

Allows you to specify UUT connections. The system will default to a two-wire connection (2W). No four-wire (4W) connection is available.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5220 FSC.

Memory Allocation

The last system stimulus of the test is normally saved (in Nominal units) in MEM1. If MOD4 is N, it is saved in MEM. If no Nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection the operator is asked to make the required changes and press [ADV].

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV].

- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

This FSC programs the 5440 DV Calibrator to provide DC Volts (-1100 to 1100 V) stimulus or DC current, using the 5220A Transconductance Amplifier. An example of the 5440 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	5440	200	190mV	.1%					2W

PARAMETERS

NOMINAL

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 5440 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<Nominal> <prefix>V

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, k, or g followed by a V (Volts) or A (Amps). There is an automatic translation of units that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m or M	m 10^{-3}
k or K	K 10^{3}
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are -1100V to +1100V and -20A to +20A.

- The nominal and its units may contain up to 14 characters.
- A nominal of * sets the 5440 (and the 5220A for current output) to standby. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.
- If just nominal units are entered (e.g., mV), the nominal will be that of MEM plus the units specified.
- A nominal of CAL initiates the 5440 Internal Calibration sequence. This is a setup test, so MOD4 will automatically be assigned as S.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range per division > data, no automatic range message will occur.

- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
< % of nominal> %	This tolerance is the percent of the nominal value.
< % of range> /	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units> U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance if inferred.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

MOD1 is not used

MOD2

Allows specification of divider override. If '0' is specified the divider override is enabled. This action prevents automatic invocation of the divider output if the nominal is between -2.2V and +2.2V. '0' is appropriate if the required resolution of the 5440 is greater than or equal to 1uV for the output between -2.2V and +2.2V. If better resolution is required in this range, leaving this field blank will cause the output to originate at the divider output terminals.

MOD3

Allows specification of the guard connection. If G is specified the external guard becomes active. If nothing

is entered the guard is internally shorted to low. The guard is appropriate for low level voltages where noise could affect the response of the unit under test.

MOD4

Specifies the general mode of the test. There are four options which are summarized below.

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.

S — Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another

5440 Setup test or until a results-generating FSC is completed. 5440 settling times will vary depending on nominal value requested.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C — Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

This field specifies the UUT connection to the TI Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection to

the 5440 Output terminals. If 4W is specified the system will specify a four-wire connection to the 5440 Output and Sense terminals. Four wire is not applicable for divider output connections.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5440 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the Test Interface Panel, the operator is asked to make the required disconnections and connections and press the ADV display key. If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

This FSC programs the 5450 Resistance Calibrator to provide ohms (1 ohm to 100 Megohm) stimulus. An example of the 5450 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	5450	100	100MZ	.1%					2W

PARAMETERS

The following parameters apply to the 5450 FSC.

Nominal

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 5450 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<Nominal> <prefix>Z

<Nominal> <prefix>Y

ALLOWED PREFIXES

The allowed units are: none, p, n, u, m, k, or g followed by a Z (Ohms) or Y (Siemens). There is an automatic translation of units that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
k or K	K 10^{3}
M	M 10^{6}
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

0Z (short)

1Z to 100MZ (in factors of 10)

1.9Z to 19MZ (with factors of 10)

1Y to 10nY (in factors of 10)

.52631Y to 52.631nY (with factors of 10)

- The nominal and its units may contain up to 14 characters.
- A nominal of * sets the 5450 to open. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.
- If just nominal units are entered (e.g., Z), the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range per division > data, no automatic range message will occur.
- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal> %	This tolerance is the percent of the nominal value.
<% of range> /	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units> U Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance if implied.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

MOD1 is not used.

MOD2

MOD2 is not used.

MOD3

MOD3 is not used.

MOD4

Specifies the general mode of the test. There are four options which are summarized below.

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews the system CRT display until it equals the reading on the unit under test and an evaluation based on the final CRT reading is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or

results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another 5450 Setup test or until a results-generating FSC is completed.

N — Nominal Set test. The operator slews the system CRT display until it equals the reading on the unit under test. The final system CRT reading is saved in MEM. No evaluation or results are generated, however, tolerances are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C — Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. This field specifies the UUT connection to the 5450 output terminals on the Test Interface Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection. If 4W is specified the system will specify a four-wire connection to the 5450 Output panel.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 5450 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections and press the ADV display key. If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

The 6011 FSC programs the Fluke 6011A Synthesized Signal Generator to provide V ac (10 Hz to 10.99999 MHz) stimulus. Example:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
10.006	6011		.24VP		50KH				S

PARAMETERS

The following parameters apply to the 6011 FSC.

Nominal

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 6011A will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<nominal><prefix>V or VP or D or H or T

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by a V (volts rms), VP (volts peak to peak), D (dBm into 50 ohms), H (frequency in Hz) or T (time in seconds). There is an automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{6} (if H)
m or M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

If the connection is L, the output is calibrated into a 50-ohm load; if the connection is blank, the output is calibrated into an open circuit.

ALLOWED VALUES

The allowed nominal values are:

+26.98D to -55.01D with 50-ohm reference.

5.0000V to 0.3972mV into 50 ohms (up to 10V into open).

10H to 10.99999MH.

- The nominal and its units may contain up to 14 characters.
- A nominal of * sets the 6011A to standby. This test is a Setup, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, a * and S are assigned.
- If the nominal is specified as T or H, the frequency is slewed; otherwise, the slew parameter is amplitude.
- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range per division>R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If MOD2 is -D, the system specifies the range without respect to /Divisions in the automatic message.
- If R is entered with no <range per division> data, no automatic range message will occur and MOD2 must be -D.
- If AR is specified, the automatic range message will be 'Autorange' and MOD2 must be -D.
- -D is automatically specified if the range is blank or autorange.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFIED
<% of nominal>%	This tolerance is the percent of the final applied stimulus (the actual 7410A source value).

<% of range>/	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by +, then the tolerance is specified from the applied stimulus value in a positive direction.
- If the tolerance is prefaced by -, then the tolerance is specified from the applied stimulus value in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.
- When the NOMINAL is specified in D (for dBm), nominal units (U) should be used in the TOLERANCE field. This rule will avoid confusion due to absolute tolerance differences in dB specifications.

MOD1

Specifies the stimulus frequency or amplitude as:

<frequency or amplitude><prefixes>V or VP or T or H or D

The units prefixes be p, n, u, m, K, M, or G. There is an automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{6} (if H)
m or M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters long, including the units and type (V, VP, T, H, or D).

- If the nominal is in amplitude (V, VP, or D), then MOD1 must specify the frequency. If the nominal is in frequency (T or H), then MOD1 must specify the amplitude.

MOD2

Specifies the mode of the automatic range and slew message.

ENTRY	RESULT
(blank)	The automatic range message is specified in units of V or VP or D or H or T/Division. The automatic slew message is specified in divisions.

-D The automatic range message is specified in units of V or VP or D or H or T. The automatic slew message is expressed in nominal units rather than divisions.

o If the range is R or AR, or if the test is a Setup (S in MOD4), MOD2 is automatically assigned as -D.

MOD3

MOD3 is not used.

MOD4

Specifies the general mode of the test. There are four options:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.
C	Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON (connection)

Connection. Specifies the load into which the 6011A output is calibrated:

- No Entry: An open load is assumed.
- L: The 6011A is calibrated into a 50-ohm load. L must be specified if dBm units are used for the amplitude.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 6011 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will be automatically displayed by the system unless they are purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI (Test Interface) panel, the operator is asked to make the required connections and disconnections, then press the ADV display key. The stimulus originates at the Low Frequency Terminal of the Generator Output port of the Test Interface Panel.

- If the UUT range has changed from the last instrument-oriented FSC, the operator is asked to set the new range and then press the ADV display key. A range message is not produced for a Setup test or if the range is R. In the event the nominal value is an amplitude, the range message is:

  Set UUT [MEM2] To The -- V or dBm/Division Range...

- If the nominal value is a frequency or time, the range message is:

  Set UUT [MEM2] To The -- Sec or Hz/Division Range...

- Note that MEM2 may be assigned (e.g., as 'Left Time Base' or 'Chan 2 Vertical Amplifier') prior to implementation of the 6011 FSC. The assignment of MEM2 is used to make the messages more specific or to pass a parameter to a subprocedure for performing a test on two identical channels with one subprocedure. If MOD2 is -D, the '/Division' is not presented in the message.

- If there is a pending MESS (see MESS FSC), it is displayed and is followed by the slew message. A Setup test produces no MESS lines or slew message. If the nominal is an amplitude, the slew message is:

  Adjust System Stimulus For A UUT Vertical Reading
  Of -- Divisions...

- If the nominal specifies a frequency (or time), the slew message is:

  Adjust System Stimulus For A UUT Horizontal Reading
  Of -- Divisions...

- The number of divisions is computed from the range and nominal values. If MOD2 is -D, the message is:

  Adjust System Stimulus For a UUT Reading
  Of -- V or Hz or Sec or dBm...

Use Of MEM As Nominal

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 6011A.

DESCRIPTION

This FSC programs the 6060B (or A) Synthesized Signal Generator to provide AC volts (10kHz to 1.05GHz) stimulus. An example of the 6060 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	6060	100	20MH	1%		.3VP		-D	

PARAMETERS

The following parameters apply to the 6060 FSC.

NOMINAL

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 6060 will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<Nominal> <prefix> V or VP or D or H or T

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M or g followed by a V (Volts) VP (volts peak to peak) or D (DBm into 50 ohms), H (frequency in Hz) or T (time in seconds). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	M 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values for the Fluke 6060B are:

-127D to +19D from 10KH to 1050MH

10 KH 1050 from -147 to +19D

The allowed values for the Fluke 6060A are:

-137D to +13D from 10 kHz to 1050 MH

100 kH to 1050 MH from -147 to +19D

- Note the difference in the allowed nominal values for 6060A and 6060B. The procedure writer must know which instrument the procedure will use and enter the values accordingly.

- The nominal and its units may contain up to 14 characters.

- A nominal of * sets the 6060 to standby (-137 dBm with all other programmed characters the same). This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.

- If the nominal is T or H, the frequency is slewed; otherwise, the slew parameter is amplitude.

- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If MOD2 is -D, the system specifies the range without respect to /Divisions in the automatic message.

- If R is entered with no <range per division > data, no automatic range message will occur and MOD2 must be -D.

- If AR is specified, the automatic range message will be 'Autorange' and MOD2 must be -D.

- -D is automatically specified if the range is blank or autorange.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TEST TYPE
<% of nominal> %	This tolerance is the percent of the nominal value.
<% of range> /	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units> U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.
- When the NOMINAL is specified in D (for dBm), nominal units (U) should be used in the TOLERANCE field. This rule will avoid confusion due to absolute tolerance differences in dB specifications.

MOD1

Specifies the stimulus frequency or amplitude as:

<frequency or amplitude> <prefix> V or VP or T or H or D

- The prefixes may be: p, n, u, m, K, M, or G. There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including the prefixes and units (V, VP, T, H, or D).

- If the nominal is in amplitude (V, VP, or D), then MOD1 must specify the frequency. If the nominal is in frequency (T or H), then MOD1 must specify the amplitude.

MOD2

Specifies the mode of the automatic range and slew message.

ENTRY	MESSAGE
(blank)	The automatic range message is specified in units of V or dBm or Hz or Sec/Division. The automatic slew message is specified in divisions.
-D	The automatic range message is specified in units of V or dBm or Hz or Sec. The automatic slew message is expressed in nominal units rather than divisions.

- If the range is R or AR, MOD2 is automatically assigned as -D. If the test is a Setup (S in MOD4), -D is not used.

MOD3

MOD3 is not Used.

MOD4

Specifies the general mode of the test. There are four options which are summarized below.

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No

N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another 6060 Setup test or until a results-generating FSC is completed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances

are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.

C Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. Not used. The RF FREQ output is always calibrated for a 50 ohm load.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 6060 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections.

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then

  press the ADV display key. A range message is not produced for a Setup test of if the range is just R. If the nominal value is an amplitude, the range message is:

  Set UUT [MEM2] To The --V or dBm/Division Range ...

- If the nominal value is a frequency or time, the range message is:

  Set UUT [MEM2] To The --Sec or Hz/Division Range ...

- Note that MEM2 may be assigned (e.g. as 'Left Time Base' or 'Chan 2 Vertical Amplifier' prior to implementation of the 6060 FSC. The assignment of MEM2 is used to make the messages more specific of to pass a parameter to a subprocedure for performing a test on two identical channels with one subprocedure. If MOD2 is -D, the '/Division' is not presented in this message.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message. If the nominal is an amplitude, the slew message is:

  Adjust System Stimulus for A UUT Vertical Reading Of -- Divisions ...

- If the nominal specifies a frequency (or time), the slew message is:

  Adjust System Stimulus for A UUT Horizontal Reading Of -- Divisions ...

- The number of divisions are computed from the range and nominal values. If MOD2 is -D, the slew message is:

  Adjust System Stimulus for A UUT Reading Of -- V or Hz or Sec or dBm ...

Modulation

The 6060 FSC may be preceded by the M606 FSC if the desired stimulus requires a modulation parameter.

Use Of MEM As Nominal

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 6060A.

DESCRIPTION

The 6071 FSC programs the Fluke 6071A Synthesized Signal Generator to provide V ac (200 kHz to 1.04 GHz) stimulus. A fixed amplitude (approximately 2V P-P into 600 ohms), low frequency (20 Hz-200 kHz), low accuracy output is also available. The following is an example of the 6071 FSC:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	6071	100	20MH	1%		.3VP		-D	

PARAMETERS

The following parameters apply to the 6071 FSC.

Nominal

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the 6070A/6071A will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<nominal><prefix>V or VP or D or H or T

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by a V (volts rms), VP (volts peak to peak), D (dBm into 50 ohms), H (frequency in Hz) or T (time in seconds). The nominal must be expressed as T or H if the frequency is less than 200 kHz. There is an

automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{6} (if H)
m or M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

-139.9D to +19D from 200KH to 519.999999MH.

-139.9D to +13D from 520MH to 1039.999998MH.

200KH to 519.999999MH from -139.9D to +19D.

520MH to 1039.999998MH from -139.9D to +13D.

20H to 199KH at approximately 1V (no MOD1 value allowed) into 600 ohms.

The nominal field may contain up to 14 characters.

A nominal of * sets the 6071A to standby (-139.9 dBm with all other programmed parameters the same). This test is a Setup, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, a * and S are assigned.

- If the nominal is specified as T or H, the frequency is slewed; otherwise, the slew parameter is amplitude.

- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range per division>R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If MOD2 is -D, the system specifies the range without respect to /Divisions in the automatic message.

- If R is entered with no <range per division> data, no automatic range message will occur and MOD2 must be -D.

- If AR is specified, the automatic range message will be 'Autorange' and MOD2 must be -D.

- -D is automatically specified if the range is blank or autorange.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This

field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	This tolerance is the percent of the final applied stimulus (the actual 7410A source value).
<% of range>/	This tolerance is the percent of range as entered in the RANGE field.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

- When the NOMINAL is specified in D (for dBm), nominal units (U) should be used in the TOLERANCE field. This rule will avoid confusion due to absolute tolerance differences in dB specifications.

MOD1

Specifies the stimulus frequency or amplitude as:

<frequency or amplitude><prefix>V or VP or T or H or D

The prefixes may be p, n, u, m, K, M, or G. There is an automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	m 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters long, including the units and type (V, VP, T, H, or D).

- If the nominal is in amplitude (V, VP, or D), then MOD1 must specify the frequency. If the nominal is in frequency (T or H), then MOD1 must specify the amplitude. If the nominal frequency is less than 200 kHz, MOD1 is not used.

- The frequency/amplitude restrictions as stated in the nominal value section apply to MOD1 as well, except that MOD1 must be greater than or equal to 200 kHz.

MOD2

Specifies the mode of the automatic range and slew message.

ENTRY	RESULT
(blank)	The automatic range message is specified in units of V or dBm or Hz or Sec/Division. The automatic slew message is specified in divisions.
-D	The automatic range message is specified in units of V or dBm or Hz or Sec. The automatic slew message is expressed in nominal units rather than divisions.

- If the range is R or AR, MOD2 is automatically assigned as -D. If the test is a Setup (S in MOD4), -D is not used.

MOD3

MOD3 is not used.

MOD4

Specifies the general mode of the test. There are four options (summarized in Table 3A-13):

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No

N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or

results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON (Connection)

Connection. Not used, the HIGH FREQ output is always calibrated for a 50-ohm load; the MOD output is calibrated for a 600-ohm load.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 6071 FSC.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will be automatically displayed by the system unless they are purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI (Test Interface) panel, the operator is asked to make the required connections and disconnections. If the frequency is greater than or equal to 200 kHz, the stimulus originates at the High Frequency Terminal of the Test Interface Panel. At lower frequencies, the stimulus originates at the MOD Terminal of the Test Interface Panel.

- If the UUT range has changed from the last instrument-oriented FSC, the operator is asked to set the new range and then press the ADV display key. A range message is not produced for a Setup test or if the range is just R. If the nominal value is an amplitude, the range message is:

  Set UUT [MEM2] To The -- V or dBm/Division Range...

- If the nominal value is a frequency or time, the range message is:

  Set UUT [MEM2] To The -- Sec or Hz/Division Range...

- Note that MEM2 may be assigned (e.g., as 'Left Time Base' or 'Chan 2 Vertical Amplifier') prior to implementation of the 6071 FSC. The assignment of MEM2 is used to make the messages more specific or to pass a parameter to a subprocedure for performing a test on two identical channels with one subprocedure. If MOD2 is -D, the '/Division' is not presented in the message.

- If there is a pending MESS (see MESS FSC), it is displayed and is followed by the slew message. A Setup test produces no MESS lines or slew message. If the nominal is an amplitude, the slew message is:

  Adjust System Stimulus For A UUT Vertical Reading Of --
  Divisions...

- If the nominal specifies a frequency (or time), the slew message is:

  Adjust System Stimulus For A UUT Horizontal Reading Of
  Divisions...

- The number of divisions are computed from the range and nominal values. If MOD2 is -D, the message is:

  Adjust System Stimulus For a UUT Reading Of --
  V or Hz or Sec or dBm...

Sweep Or Modulation

The 6071 FSC may be preceded by the MGEN FSC if the desired stimulus requires sweep or modulation parameters.

Use Of MEM As Nominal

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 6071A.

DESCRIPTION

This FSC programs the Fluke 8502 and 8505A Digital Voltmeter. V dc (up to 1100V), V ac (up to 1100V), current (up to 1.28A) and resistance (up to 100megohm) measurement. an example of the 8505 FSC is shown below:

```
STEP   FSC  RANGE NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON

1.006  8505  A    11.5V   .7U                          2W
```

PARAMETERS

Nominal

Specifies the nominal value for test. This parameter is the value that you anticipate the 8502 or 8505A to measure. It is entered by:

<Nominal> <prefix> <units>

The allowed prefixes are: none, p, n, u, m, k, or g followed by a V (Volts), D (Decibels), A (Amps), Y (Siemens), or Z (Ohms). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if Z)
m or M	m 10^{-3} (if not Z)
k or K	K 10^{3}
M	M 10^{6} (if Z)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

V dc: -1100V to 1100V

V ac: 0 to 1100V VxH less than 20,000,000

< 73.838 dBm @ 50 ohms

< 72.077 dBm @ 75 ohms

< 66.056 dBm @ 300 ohms

< 63.046 dBm @ 600 ohms

DCI: -1.28A to 1.28A

ACI: 0A to 1.28A

Resistance: > 10 n siemens, 0 to 100 megohms

- The nominal and its units may contain up to 14 characters.
- A nominal of * sets the 8502 and 8505A to standby. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.

- If just nominal units are entered (e.g., mV), the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range per division > data, no automatic range message will occur.
- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal> %	This tolerance is the percent of the nominal value.
<% of range> /	This tolerance is the percent of range as entered in the RANGE field.

<ppm of nominal> P% This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units> U Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is implied.
- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

MOD1: Specifies the stimulus frequency as:

<frequency> <prefix>H

- The allowed frequency range is 10 Hz to 1 MHz.
- The units may be: p, u, none, K, M, or G. There is an automatic translation of units that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	m 10^{-3}
k or K	K 10^{3}
M	M 10^{6}
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including the units and H.

- The allowed frequency must have a Volts-Hertz product of < 20,000,000.

MOD2

MOD2 specifies the load impedance if the nominal is in dBm units. The allowed values are: 50 ohms, 75 ohms, 300 ohms, and 600 ohms. The entry syntax is:

Entry: Impedance Is:

5Z 50 ohms

7Z 75 ohms

3Z 300 ohms

6Z 600 ohms

- If the nominal is specified in dBm and no MOD2 is specified, the default value of 6Z will be automatically inserted.

MOD3

MOD3 specifies the coupling mode of the 8502 or 8505A. The allowed entries are:

- None: The default parameter is AC+DC coupling.
- F: AC coupling will be invoked (required with averaging ac converter).

The following additional option is available when the system is configured as a 7405A system with TI panel.

E Accuracy Enhancement

Accuracy Enhancement will be automatically invoked if the following conditions are met:

- Nominal greater than 0.2V
- Not a Setup test
- Frequency greater than 50 Hz and less than 10 KHz
- Tolerance less than 0.2%
- AC & DC coupling used

-E Prevent automatic insertion of Accuracy Enhancement

MOD4

MOD4 specifies the general mode of the test. There are four options which are summarized below:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes

S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY — TEST TYPE

(blank) The operator is asked to set the nominal output from the UUT, and place it in operate. The measurement is made and the operator is asked to take the UUT out of operate. Results are then generated and displayed to the operator. The resultant measurement is stored in MEM1.

S Setup test. The system displays any pending MESS (see the MESS FSC) lines to the operator, then displays the present measurement on the controller screen which is continually updated. After the operator presses the ADV display key, the next procedure line is immediatedly executed. The measured value is stored in MEM1.

N Nominal Set test. The Nominal Set test acts just as a normal test except except the result is not evaluated, and it is stored in

MEM instead of MEM1. The next procedure line is executed immediately. This choice may be used in conjunction with Compare tests for frequency response or load testing.

C — The Compare test is exactly like the standard test except the final evaluation is based on the contents of MEM rather than the nominal value. This choice may be used in conjunction with Nominal Set tests for frequency response or load testing.

CON

Connection. This field specifies the UUT connection to the Test Interface Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection to the 8502/5A Volts Input/ Ohms Sense terminals. If 4W is entered, the system will prompt a connection to the 8502/5A Amps Input/ Ohms Source terminals in addition. Four-wire measurement is not applicable to current, V ac, V dc or resistance greater than 256 Kilohms.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 8505 FSC. Only the rms ac converter is supported.

MEMORY ALLOCATION ---3

Normally the system stimulus at the end of the test is saved in MEM1. If MOD4 is N, MEM contains the measurement. The saved value is saved in Nominal units.

AUTOMATIC MESSAGES

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections and press the ADV display key.

- If the UUT range and/or function has changed from the last instrument oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup test.

- The operator is asked to 'Set UUT To Source (nominal)' and 'Then Set to Operate'. Following this action the operator may press the ADV display key. This response is not solicited on a Setup test.

- If it is a Setup test, any pending MESS lines are displayed, followed by 'Present Measurement Is...', which is continually updated.

- The operator is asked to take the UUT out of the operate mode and press the ADV display key. This response is not solicited on a Setup test.

DESCRIPTION

The 8506 FSC instructs the system to make a dc voltage, ac voltage, resistance, or conductance measurement, using the 8506A Digital Voltmeter. An example of the 8506 FSC is shown below:

```
STEP  FSC  RANGE  NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
3.012 8506 A      11.5V    .7U                          2W
```

PARAMETERS

The following parameters apply to the 8506 FSC:

Nominal

Specifies the Nominal value of the anticipated measurement. The Nominal value is entered as:

<nominal><prefix><units>

ALLOWED VALUES

The values allowed for nominal are:

Volts, dc

-1100V to +1100V

Volts, ac

7 mV to 600V (V x H less than 10,000,000)

Decibels

-60.176 to 68.573 dBm @ 50 ohms
-63.697 to 66.812 dBm @ 75 ohms
-75.739 to 60.791 dBm @ 300 ohms
-81.759 to 57.781 dBm @ 600 ohms

Amps, dc only

-1.28A to 1.28A

Resistance

0 ohms to 265 megohms

Conductance

> 3.8 nS

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

VOLTS	AMPS (dc)	OHMS	SIEMENS	DECIBELS	MULTIPLIER
V	A	Z	Y	D	1
pV or PV	pA or PA	pZ or PZ	pY or PY	pD or PD	10^{-12}
nV or NV	nA or NA	nZ or NZ	nY or NY	nD or ND	10^{-9}
uV or UV	uA or UA	uZ or UZ	uY or UY	uD or UD	10^{-6}
mV or MV	mA or MA		mY or MY	mD or MD	10^{-3}
kV or KV	kA or KA	kZ or KZ	kY or KY	kD or KD	10^{3}
		mZ or MZ			10^{6}
gV or GV	gA or GA	gV or GZ	gY or GY	gD or GD	10^{9}

- A maximum of 14 characters is allowed for the Nominal value.

- A Nominal value of * (asterisk) resets the 8506A. This causes a Setup test, and MOD4 will automatically be set to S.

- If a <RETURN> is entered, with no additional data, an * (asterisk) is implied.

- If units are entered without a Nominal value (e.g., mV), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal Value. The UUT range is entered as:

<range>R

After the line has been read and verified by the system, the R is removed (from the procedure record).

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the nominal value.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<absolute units>U	Tolerance as an absolute value (units are the same as those used for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is not allowed in an indented adjustment.
- Percentage of range (% of range)/ or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Specifies the frequency of the Nominal value stimulus (for ac tests).

<frequency><prefix>H

The allowed frequency range is 10 Hz to 1 MHz.

The 7411B interprets MOD1 unit prefixes as follows:

UNITS	MULTIPLIER
none	1
p or P	10^{-12}
n or N	10^{-9}
u or U	10^{-6}
k or K	10^{3}
m or M	10^{6}
g or G	10^{9}

- A maximum of 14 characters is allowed for the MOD1 field.
- The allowed frequency must have a Volt-Hertz product of < 10,000,000.

MOD2

Specifies the dBm load impedance for the Nominal value. The allowed impedances for dBm measurements are: 50 ohms, 75 ohms, 300 ohms, and 600 ohms.

The dBm load impedance is selected by entering one of the following:

ENTRY	dBm LOAD IMPEDANCE
5Z	50 ohms
7Z	75 ohms
3Z	300 ohms
6Z	600 ohms

If MOD2 is left blank and the Nominal was specified in dBm, the system defaults to a dBm load impedance of 600 ohms.

MOD3

Specifies whether accuracy enhancement will be used during a measurement. (In AC mode ac+dc coupling is also controlled using this field.) For more information on accuracy enhancement refer to the "MISCELLANEOUS" heading of this FSC description. The results of entries for MOD3 are given in the following table:

ENTRY	FUNCTION	RESULT
no entry	VDC	Volts dc function selected, 128 samples/reading, fast filter.
no entry	VAC	Volts ac "ENH'D" function selected, ac+dc coupling enabled.
E	VDC	Volts dc function selected, "AVG" mode (1024 samples/reading) enabled, slow filter enabled.
	VAC	Volts ac function selected, "ENH'D ACC" mode enabled, ac coupling enabled.
E	VAC	Voltage ac function selected, "HI ACC" mode enabled, ac coupling enabled.

F	VAC	Volts ac function selected, "ENH'D ACC" enabled, ac coupling enabled.
FE	VAC	Volts ac function selected, "HI ACC" enabled, ac coupling enabled.
G	VAC	Volts ac function selected, "NORMAL MODE" enabled.

MOD4

Determines the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

TEST	TEST TYPE
(blank)	Evaluation test. The operator is asked to set the UUT to output the Nominal value for this test. The system makes the measurement and records the result in MEM1.
S	Setup only. The system displays any pending message (see MESS FSC) to the operator, then displays the value of the present measurement. When the operator presses ADV, the next procedure line is executed, and the measurement results are stored in MEM1.
N	Nominal Set test (without evaluation). Allows you to slew the nominal setting, with the final Nominal value saved in MEM. No results are generated. The next procedure line is executed immediately. This test may be used for initializing frequency-response tests in conjunction with Compare tests.

C — Comparison test. Similar to evaluation testing except that the system stimulus is compared to MEM instead of the Nominal value. Results are generated, and the measurement value is saved in MEM1. This test is used in conjunction with Compare tests for frequency response and load testing.

CON

Allows you to specify UUT connections. The system will default to a two-wire connection (2W). If four-wire is specified (4W), the system will request connection to the input SENSE terminals. Four-wire connections are not allowed for current, V ac, V dc, or resistance measurements greater than 256 kilohms. In a 7405A system only, if the measurement is greater than 500V ac or 750V dc, the system requests that you use a two-wire connection to the High Voltage terminals.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the 8506 FSC. Only the rms ac converter is supported.

Memory Allocation

The test measurement is normally saved (in Nominal units) in MEM1. If MOD4 is N, it is saved in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection the operator is asked to make the required changes and then press ADV.

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV]. A range message will not appear in a Setup test.

- The messages "Set UUT To Source (Nominal Value)" and "Then Set To Operate" appear when the 8506 FSC is executed. The procedure continues after the operator has performed the requested operations and pressed [ADV]. These messages do not appear in a Setup test.

- If there are any pending messages during a Setup test, they are displayed followed by the message "Present Measurement Is... "(the present measurement is continuously updated).

- The system requests that the operator remove the UUT from its operational mode and press [ADV]. This message does not appear in a Setup test.

Accuracy Enhancement

The following describes accuracy enhancement as it pertains to the 8506A:

IN VOLTS DC:

No entry in the MOD3 field will result in the DMM being placed in the "S7" sample rate, "F0" filter mode and autorange.

An "E" in the MOD3 field will result in the DMM being placed in the "AVG" operating mode, which will result in the "S10" sample rate, "F" filter mode and autorange. This mode of operation will result in an improved noise floor and specification for the DMM.

For a more comprehensive explanation of these operating modes of the DMM refer to the DMM manual.

IN VOLTS AC:

No entry or "F" in the MOD3 field will result in the DMM being placed in the "ENH'D" mode of operation either with or without ac+dc coupling enabled. This mode of operation begins by taking a single reading in the "HI ACC" mode of operation and storing a correction factor (requires approximately 6 seconds). After the initial reading the 8506A operates at approximately 2 readings/second applying the correction factor to each reading. In a stable environment, this will result in the DMM making measurements to the same accuracy as the "HI ACC" mode for a period of 5 minutes. If the input changes by more than plus or minus 1% the measurement process will begin again with a single "HI ACC" reading.

An "E" or "FE" in the MOD3 field will result in the 8506A being placed in the "HI ACC" mode of operation with or without ac+dc coupling. In this mode all readings will require approximately 6 seconds. The advantage of this mode is that every measurement involves a correction factor and therefore the best specifications are maintained for all measurements regardless of time, environment, or level.

For a more comprehensive explanation of these operating modes of the DMM refer to the DMM manual.

DESCRIPTION

The 8520 FSC programs the Fluke 8520A Digital Multimeter to measure Vdc (up to 40 kV), Vac (up to 650V), conductance (down to 10 nS), and resistance (up to 100 megohms).

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
2.001	8520	5	5V	3%					2W

PARAMETERS

The following parameters apply to the 8520 FSC.

Nominal

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the approximate value which the 8520A will measure; otherwise, it is the expected measurement value against which the UUT will be evaluated. The nominal value is entered by:

<nominal><prefix>V or D or Z or Y

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, or G, followed by a V (volts rms), D (dBm), Z (resistance in ohms), or Y (conductance in siemens). There is an automatic translation of prefixes that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if Z)
m or M	m 10^{-3} (if not Z)
k or K	K 10^{3}
M	M 10^{6} (if Z)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are:

VDC: -40KV to +40KV

VAC: 0 to 650V (volt-hertz product <20M)

<69.268 dBm @ 50 ohms
<67.507 dBm @ 75 ohms
<61.487 dBm @ 300 ohms
<58.476 dBm @ 600 ohms

Resistance: <=100 megohms

Conductance: >= 10 nS

- The nominal field may contain up to 14 characters.
- A nominal of * sets the 8520A to standby. This test is a Setup, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, a * and S are assigned.
- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range in the units of the nominal value. The UUT range is entered by:

<range>

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range> data, no automatic range message will occur.
- If AR is specified, the automatic range message will be 'Autorange.'

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	This tolerance is the percent of the final measurement (the actual UUT source value).
<% of range>/	This tolerance is the percent of range as entered in the RANGE field.

<ppm of nominal> P% This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units>U Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance is inferred.
- If the tolerance is prefaced by +, then the tolerance is specified from the measured value in a positive direction.
- If the tolerance is prefaced by -, then the tolerance is specified from the measured value in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- % of range or ppm of range is not allowed when the range is blank or auto range.
- When the NOMINAL is specified in D (for dBm), nominal units (U) should be used in the TOLERANCE field. This rule will avoid confusion due to absolute tolerance differences in dB specifications.

MOD1

MOD1 specifies the stimulus frequency as:

<frequency><prefix>H

- The allowed frequency range is 10 Hz to 1 MHz.

- The units may be p, n, u, m, K, M, or G. There is an automatic translation of units that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6}
k or K	K 10^{3}
M	M 10^{6}
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including the units and type (H).

- The volt-hertz product for 0-650V ac must be less than 20 million.

MOD2

Specifies the load impedance if the nominal is in dBm units. The allowed values are 50 ohms, 75 ohms, 300 ohms, and 600 ohms. If the nominal is specified in dBm and no MOD2 is specified, the default value of 6Z will be automatically inserted. The entry syntax is defined as follows:

Entry	Impedance
5Z	50 ohms
7Z	75 ohms
3Z	300 ohms
6Z	600 ohms

MOD3

Specifies alternatives to standard tests as defined below. If MOD3 is not F and ac volts are specified, the measurement will be made in the AC+DC mode. If V dc greater than 1000 and <6000 is specified, MOD3 will automatically be assigned as F. If V dc >6000 and <40000 is specified, MOD3 will automatically be assigned as G. The F or G modifier may be specified if desired to prevent connection changes at lower voltages.

Function	MOD3
VAC, AC coupled	F
VDC, 6 kV probe	F
VDC, 40 kV probe	G

MOD4

Specifies the general mode of the test. There are four options summarized below:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The measurement is made and an evaluation based on the final UUT stimulus is made. All automatic messages may appear. System measurement (UUT Stimulus Value) is stored in MEM1.
S	Setup test. The system expects to measure the nominal value. The system displays any pending MESS (see the MESS FSC) with a continually updated display of the present measurement. No evaluations or results are generated. The next procedure record is immediately excuted when ADV is pressed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection and present measurement messages. Expected system measurement is stored in MEM1. The measurement remains until ADV is pressed.
N	Nominal Set test. The system expects to measure the nominal value. The system measures the value when the operator presses ADVance. The final system measurement (UUT stimulus value) is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system measurement is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system measurement (UUT stimulus value) is saved in MEM1.

CON

Connection. Specifies the type of connection from the UUT to the Multifunction Input Port. If nothing is specified, a normal two-wire connection is automatically inserted. If the entry is 4W, the operator is asked to connect to the 8520A in a four-wire configuration.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the 8520 FSC.

Memory Allocation

Normally the system measurement (UUT stimulus) at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final measurement. If no nominal value is specified (only units), the expected measurement becomes the value in MEM.

Automatic Messages

The following messages will be automatically displayed by the system unless they are purposely defeated (see the ASK+ and ASK- FSC description):

- If the UUT range has changed from the last instrument-oriented FSC, the operator is asked to set the new range and then press the ADVance display key. A range message is not produced for a Setup test or if the range is just R. The automatic range message is:

  Set UUT [MEM2] To The --- V or dBM or Ohm or Siemens Range...

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required connections and disconnections. The measurement is made at the Multifunction Input Sense Terminals of the Test Interface Panel. If the connection is 4W, the Multifunction Input Source Terminals are also used. If there is a pending MESS (see MESS FSC) and MOD4 is S, then the MESS is displayed and is followed by the present measurement message which is continually updated.

- If MOD4 is blank, N, or C, then the automatic message is:

  Set UUT to source --- V or dBM or Ohm or Siemens at --- Hz

  Set to Operate...

  After the test another message appears:

  Take UUT Out of the Operate Mode...

If the voltage measurement is over 1000V then another message in inverse-video appears:

Caution: High Voltage Measurement of --- Volts
Ensure Ground Loop is Properly Connected

Use Of MEM As Nominal

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 8520A.

DESCRIPTION

The ASK+ FSC enables automatic messages that have been defeated by the ASK- FSC. The miscellaneous portion of this FSC description contains further information. An example of the ASK+ FSC is shown below:

```
STEP    FSC   RANGE  NOMINAL  TOLERANCE MOD1  MOD2  3  4  CON
41.001  ASK+  R      N                                    L
```

PARAMETERS

Each parameter field of the ASK+ FSC contains a single alphabetic character. If no entries are made, the system defaults to the settings described under the heading Miscellaneous. The following paragraphs describe the use of ASK+ FSC parameter fields.

Range

Entering R enables messages that ask the operator to set the UUT to a specific range and function, then press [ADV] (display key).

Entering D gives range messages in terms of units per division for oscilloscope calibration

Nominal

For stimulus FSCs, entering N enables the following message line:

Adjust Stimulus For...

For measurement FSCs, entering N enables the following messages:

```
Set UUT To Source...
Then Set To Operate
Take UUT out of the Operate Mode...
```

Tolerance

Entering P causes the last line executed to be repeated when the operator presses REP.

If J is entered, when a test exceeds the ADJUSTMENT THRESHOLD (or the test fails) and an indented adjustment routine exists for the test, the operator is given the opportunity to [ADJ] the instrument (if ASK+ F or A is in effect).

Entering S causes all SET FSC messages to be displayed as described in the SET FSC description.

MOD1

For measurement FSCs, entering M enables MOD1 from FSC (frequency or amplitude) to be displayed on:

```
Set UUT To Source... At [MOD1]
Then Set To Operate...
```

For stimulus FSCs, entering M enables the frequency to be displayed on the Adjust Stimulus For... message line during slew tests.

MOD2

Entering an A or an F enables the system to solicit a response from the post-test summary (test result display) in all cases.

MOD3

Entering L enables the [LIST] display key to appear on the post-test summary display. This allows the operator to list the procedure on the display.

MOD4

Entering T enables the [TERM] display key to appear on the post-test summary display. This allows the operator to terminate the calibration procedure before the end of the procedure.

CON

Entering W enables all automatic connection messages.

MISCELLANEOUS

- The system automatically begins each calibration with the following ASK configuration:

  ASK+ R D(or -D) N P J S M A L T W

- Meter Calibration Stations default to ASK- D. Oscilloscope Calibration Stations default to ASK+ D.

- The default configuration remains in effect unless an ASK- is executed, in which case an ASK+ will reenable the defeated automatic messages.

- ASK+ of a parameter already enabled has no effect.

- ASK+ and ASK- parameters are passed from procedure to subprocedure as if the subprocedure were part of the main procedure.

DESCRIPTION

The ASK- FSC allows you to selectively defeat automatic messages and their results. These automatic messages normally appear when the operator runs the procedure. An example of the ASK- FSC is shown below:

```
STEP    FSC   RANGE  NOMINAL TOLERANCE MOD1  MOD2  3  4  CON
34.001  ASK-  R      N                                    L
```

PARAMETERS

Each parameter field of the ASK- FSC contains a single alphabetic character. If no entries are made, the system defaults to the settings described under the heading "MISCELLANEOUS" heading of the ASK+ FSC description. The following paragraphs describe the use of ASK- FSC parameter fields.

Range

Entering D disables the units per division for any range messages. All automatic range message will then be given as straight units. This is used primarily for meter calibration.

Entering R defeats messages that ask the operator to set the UUT to a specific range and function. The system advances to the next procedure step.

The ASK- R is useful if the automatic range/function messages do not match those of the UUT. In this case you may wish to write alternate messages using the DISP or SET FSC.

Suppressing non-critical automatic messages is useful for speeding up the calibration process or adjusting the system to match different operator skill levels.

Nominal

For stimulus FSCs, entering N disables the following message line:

Adjust Stimulus For...

The slew and advance responses are still requested. This feature is useful when you write a slew message using the MESS FSC and you do not want the automatic message.

For measurement FSCs, entering N disables the following messages:

Set UUT To Source...
Then Set To Operate

Take UUT out of the Operate Mode...

It may be necessary to disable these messages if the procedure is to test UUTs that may not be turned on or off (e.g., power supplies).

Tolerance

Entering P allows the transfer of control to the .001 Step (i.e., if [REP] is pressed at line 12.000, then control transfers to 12.001) when the operator presses [REP].

If J is entered when a test exceeds the ADJUSTMENT THRESHOLD (or the test fails) and an indented adjustment routine exists for the test, then the

indented adjustment routine is executed if the operator presses [ADV] or if ASK- A or F are in effect. This option allows for mandatory calibration adjustments. Entering S causes all operator SET FSC messages to be suppressed. However, the SET file is saved so the operator may view it using [STEP].

MOD1

For measurement FSCs, entering M disables the appearance of MOD1 information in the following messages:

Set UUT To Source... At [MOD1]
Then Set To Operate...

This message may be defeated for UUTs with non-adjustable frequency.

For stimulus FSCs (during the slew message), entering M disables the MOD1 display in the following message:

Adjust Stimulus For...

MOD2

Entering A disables the operator response to the post-test summary at all times. The test result is momentarily displayed and the next procedure line is executed (unless it is an indented adjustment and ASK+ J is in effect).

Entering F disables the operator response to the post-test summary unless the test fails. If the test fails, the operator is presented with the choice of [ADV], [REP], [TERM], [LIST], [REM], or [ADJ] (if the procedure contains an indented adjustment and ASK+ J is in effect). A failure in this case is defined as a %TOL

greater than the adjust threshold or a test result of fail (which may only occur by operator response). If the test does not meet the fail criteria, the system automatically performs an advance to the next line of the procedure (unless it is an indented adjustment and ASK+ J is in effect).

MOD3

Entering L disables [LIST] on the post-test summary display. This option prevents the operator from viewing the procedure and subsequently skipping portions of the procedure.

MOD4

Entering T disables the presentation of [TERM] on the post-test summary display. This option prevents the operator from prematurely ending the calibration.

CON

Entering W disables all connection messages to the operator. The LEDs above the active ports remain lit. If the connection messages are disabled, the system will assume that a connection was made to the active port at the time connection messages are reenabled.

MISCELLANEOUS

The following miscellaneous information applies to the ASK- FSC.

- ASK- parameters continue from procedure to subprocedure as if the subprocedure were part of the main procedure.

- Meter Calibration Stations default to ASK- D. Oscilloscope Calibration Stations default to ASK+ D.

- If a message has been already defeated, a subsequent ASK- defeat of the same message will have no effect.

DESCRIPTION

The CALL FSC allows you to call a subprocedure from the main procedure. When the 7411B Calibration Software encounters a CALL FSC, the corresponding subprocedure is executed. The subprocedure is terminated, and the system returns to the next line of the main procedure (following the CALL FSC), when an End is encountered.

PARAMETERS

The following parameters apply to the CALL FSC.

Nominal through MOD1

Specifies the UUT name (INSTRUMENT) in the procedure you wish to call. The Nominal through MOD1 entry must conform to the following rules:

1. A maximum of 55 characters is allowed for the Nominal through MOD1 entry.

2. Any blanks to the left of the entry are automatically removed to ensure compatibility.

MISCELLANEOUS

The following miscellaneous information applies to the CALL FSC:

- The SET file remains unchanged.

- A subprocedure cannot call another procedure or subprocedure. The subprocedure must be present on the same disk as the main procedure. This disk must remain in the drive since the subprocedure is

loaded from disk prior to execution, and the main procedure is reloaded when the subroutine execution is completed.

- When a subprocedure is entered, the DRAW parameters are those of the main procedure. If the DRAW parameters are changed in the subprocedure, then the original main procedure DRAW parameters are restored when the subprocedure End is executed.

- Results for called subprocedures consist of the test number of the Step for the CALL FSC, followed by a dash, followed by the test number of the called subprocedure (e.g., 23-1).

- In the 7411B program, procedures are called directly with their name, which by definition is identical to the entry of the first INSTRUMENT field in the header of the procedure. If a procedure has more than one INSTRUMENT field, the additional entries are not directly recognized by the 7411B system. The message reported by the 7411B system in that case will be "Procedure Not Found".

  The CALL FSC must therefore name a procedure name which is the first entry in the INSTRUMENT field in the procedure header. If a second procedure name is to be called, another (copy) procedure should be created with that name as the first INSTRUMENT: field entry.

DESCRIPTION

The CON FSC allows you to specify a change in the UUT's connections with an automatic message. The CON FSC is used in place of the DISP FSC for two reasons:

1. The message is identical in format to the other automatic messages.

2. It allows the system to remember the present connection so that an automatic message will not be repeated during the execution of the procedure.

An example of the CON FSC is shown below:

```
STEP FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
         CON   1024
```

PARAMETERS

The following parameters apply to the CON FSC.

Nominal

Specifies a binary decimal code to indicate what instrument port(s) should be connected.

Code Descriptions

Each instrument connection code is associated with a particular instrument's output or input connector. The binary instrument connection codes (specified under the Nominal parameter field) are described in the following table:

BINARY DECIMAL CODE	7411B CONNECTION MESSAGES
1	1953 Frequency Input A
2	1953 Frequency Input B
4	2500EP Output
8	278 Function Output
16	CG5001 OUTPUT With Comparator Head
32	CG5001 OUTPUT With Pulse Head
64	CG5001 TRIGGER OUTPUT
128	5100B Output With AC Divider
256	5100B Output
512	5100B Sense
1024	5100B Wideband
2048	5220A Hi Current Source
4096	5205A Hi Voltage Output
8192	5200A Output
16384	5200A Sense
32768	5215A Source
65536	5440 Divider Terminals
131072	5440 Guard Terminal
262144	5440 Output Terminals
524288	5440 Sense Terminals
1048576	5450A Sense
2097152	5450A Source
4194304	5450A External Guard
8388608	6010A/6011A Output
16777216	6060B RF Output
33554432	6070/71 Output MOD
67108864	6070/71 Output SWEEP
134217728	6070/71 RF Output
268435456	8502/5 Input Sense
536870912	8502/5 Input Source
1073741824	Hi Voltage Measurement
2147483648	8506A Volts Input
4294967296	8506A Amps Input
8589934592	8520A Input With 40 KV Probe
17179869184	8520A Input With 6 KV Probe

BINARY DECIMAL CODE	7411B CONNECTION MESSAGES (cont.)
34359738368	8520A Sense
68719476736	8520A Source
137438953472	DLVP Input
274877906944	Resistance Sense
549755813888	Resistance Source
1099511627776	Port 1
2199023255552	Port 2
4398046511104	Port 3
8796093022208	IEEE-488 Interface Port 1
17592186044416	RS 232 PORT 1
35184372088832	RS 232 PORT 2

BINARY DECIMAL CODE		7405A CONNECTION MESSAGES
new	old	
1	256	Frequency Input A
2	512	Frequency Input B
128	128	Multifunction Output Source With Divider
256	2	Multifunction Output Source
512	1	Multifunction Output Sense
1024	8	Wideband Voltage
2048	64	Hi Current Source
4096	4	Hi Voltage Stimulus
65536	4	5440 Divider Terminals
131072	8	5440 Guard Terminal
262144	1	5440 Output Terminals
524288	2	5440 Sense Terminals
268435456	16	Multifunction Input Sense
536870912	32	Multifunction Input Source
1073741824	4096	Hi Voltage Measurement
274877906944	1024	Resistance Sense
549755813888	2048	Resistance Source
8796093022208	16384	IEEE-488 Interface Port 1

BINARY DECIMAL CODE		7410A CONNECTION MESSAGES
new	old	
16	1	Calibrator Output SOURCE With Comparator Head
32	2	Calibrator Output SOURCE With Pulse Head
64	4	Calibrator Output TRIGGER
8388608	256	Generator Output LOW FREQ
33554432	64	Generator Output MOD
67108864	32	Generator Output SWEEP
134217728	128	Generator Output HIGH FREQ
8589934592	8192	Multifunction Input SENSE With 40 KV Probe
17179869184	4096	Multifunction Input SENSE With 6 KV Probe
34359738368	8	Multifunction Input SENSE
68719476736	16	Multifunction Input SOURCE
1099511627776	512	Port 1
2199023255552	1024	Port 2
4398046511104	2048	Port 3
8796093022208	16384	IEEE-488 Interface Port 1

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the CON FSC.

Memory Allocation

The contents of memory are not changed with the CON FSC.

Automatic Messages

The following message will be automatically displayed by the system unless they are disabled with the ASK+ and ASK- FSCs:

Connect UUT To The ---port---...

NOTE

If any other connections are present at the time of execution of this FSC, an automatic disconnection message will also appear unless the other ports have a stimulus present. If you wish to prevent the automatic disconnection message, include the code for the port that would be disconnected. CON 0 will result in a message requesting the operator to remove all connections.

DESCRIPTION

The DISP FSC is used to display messages to the operator during a calibration procedure. Up to eight lines of 56 characters can be entered in the Nominal through CON fields. The message may include several special constructions that allow you to illustrate the message with a drawing and blinking annunciator. An example of the DISP FSC is shown below:

```
STEP   FSC   RANGE NOMINAL TOLERANCE  MOD1 MOD2  3  4  CON
1.012  DISP  Turn the Instrument ON[DRAW50,90,F]
```

PARAMETERS

The following parameters apply to the DISP FSC.

Nominal through CON

Specifies the text, which may include several special constructions, of the displayed message. The following rules apply to the DISP message line:

1. A maximum of eight lines of 56 characters is allowed for the DISP message line.

2. Braces ({ and }) or square brackets ([and]) can not be entered literally since they are used to define special constructions for the DISP FSC.

3. Use the [CONT] display key to enter a message that is longer than one line. (Each additional line will have the same Step number.)

Special Constructions

The DISP FSC uses several special constructions that expand its use. The following paragraphs describe these special constructions and their use.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

[D<numeric>]

The special construction [D<numeric>] will cause a delay of the message line by <numeric> number of microseconds. The available range is from 0 to 32767 microseconds.

[DRAW--,--,-]

The DRAW construction allows you to display a simple drawing of the UUT (with a blinking annunciator) to show the location of a control or an adjustment. This drawing will appear on the right side of the Controller's screen. The DRAW construction includes three modifiers (par1, par2, and par3). The DRAW construction is entered as:

DRAW<par1>,<par2>,<par3>

The three modifiers (<par1>,<par2>,<par3>) are optional; however, the commas must still be entered. The modifiers are used for the following purposes:

- The par1 modifier is used to indicate the location of the annunciator within the drawing. This modifier is entered as a percentage of height from the bottom of the drawing.

- The par2 modifier is used to indicate the location of the annunciator within the drawing. This modifier is entered as a percentage of width from the left side of the drawing.

- The par3 modifier is used to indicate the desired view of the UUT, either front (F), back (B), left side (L), right-side (R), top (T), or bottom/underside (U).

Specifying 0 (zero) for par1 and par2 will cause the UUT drawing to be displayed without an annunciator.

Not specifying par1 and par2 (i.e., [DRAW,,par3]) will cause the UUT to be displayed and then allow you to interactively describe the position of the annunciator. In this case the system software will display four arrow display keys (Up, Down, left, and Right) that will allow you to position the annunciator.

The normal mode of operation for the procedure writer would be to enter only two commas. For example, [DRAW,,F] would display the front of the DRAWING and allow the user to position the graphic annunciator. ENTER concludes FSC entry, and the parameters will be automatically inserted.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the DISP FSC:

- Any part of a DISP message enclosed by braces is transferred directly to the results file when that line is executed.

- Items within square brackets are not transferred literally to the results file. For example,

  DISP {ADJUST R15 FOR A READING OF [MEM]V}

  will be displayed as:

  ADJUST R15 FOR A READING OF 12.01V

  and will be transferred to the results file as:

  ADJUST R15 FOR A READING OF [MEM]V.

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the DISP FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).

- Use [93], to print a right square bracket (]).

- Use [123], to print a left brace ({).

- Use [125], to print a right brace (}).

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the DISP FSC.

Memory Allocation

The contents of Memory is not changed with the DISP FSC.

Automatic Messages

There are no automatic messages with the DISP FSC.

DESCRIPTION

This FSC programs the DLVP to provide a programmable current load of 1 to 110 amps. An example of the DLVP FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	DLVP		1.1A					S	2W

PARAMETERS

The following parameters apply to the DLVP FSC.

Nominal

Specifies the nominal value for the test. If the test is a Setup (S in MOD4) then the nominal is the value to which the DLVP will be programmed; otherwise, it is the stimulus value prior to slewing the stimulus and the reading of the UUT after the stimulus is slewed. The nominal value is entered by:

<Nominal> <prefix>A

The allowed prefixes are: none, p, n, u, m, k, or g followed by a A (Amps). There is an automatic translation of prefixes that allows the use of upper-case letters. The automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m or M	m 10^{-3}
k or K	K 10^{3}
g or G	G 10^{9}

- The allowed nominal values are 1 to 110 Amps.
- The nominal and its units may contain up to 14 characters.
- A nominal of * sets the DLVP to standby. This is a setup test, so MOD4 will automatically be assigned as S. If a carriage return with no data is entered, * and S are assigned.
- If just nominal units are entered (e.g., A), the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

< range per division > R

After the line is verified, the R disappears.

- RANGE is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range per division > data, no automatic range message will occur.

- If AR is specified, the automatic range message will be 'Autorange'.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters in length, and any combination of up to three of the following entries (within the 13 character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal> %	This tolerance is the percent of the nominal value.
<% of range> /	This tolerance is the percent of range as entered in the RANGE field.
<absolute units> U	Units are the same as those used in the NOMINAL field.

- If the tolerance is unsigned, a plus or minus tolerance if inferred.

- If the tolerance is prefaced by a +, then the tolerance is specified from the applied stimulus in a positive direction.

- If the tolerance is prefaced by a -, then the tolerance is specified from the applied stimulus in a negative direction.

- A tolerance is not allowed with a setup test. Therefore, tolerance is never allowed in an indented adjustment.

- % of range or ppm of range is not allowed when the range is blank or autorange.

MOD1

MOD1 is not Used.

MOD2

MOD2 is not Used.

MOD3

MOD3 is not Used.

MOD4

Specifies the general mode of the test. There are four options which are summarized below:

MOD4 ENTRY	MEM*	MEM1	RESULTS
No Entry	Unchanged	Contains final value of system stimulus	Yes
S	Unchanged	Contains value of system stimulus	No
N	Contains final value of system stimulus	Unchanged	No
C	Contains value used for UUT INDICATED	Contains final value of system stimulus	Yes

* If no nominal is specified then MEM contains the value of the initial system stimulus.

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another DLVP Setup test or until a results-generating FSC is completed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated, however, tolerances are required to determine slew increments. The next procedure line is executed immediately. This test may be used in conjunction with Compare tests.
C	Compare test. This test is performed exactly as if no No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. This process is used in conjunction with the Nominal set test. The system stimulus value is saved in MEM1.

CON

Connection. This field specifies the UUT connection to the Test Interface Panel. If nothing is entered the system will automatically insert 2W for a two-wire connection.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the DLVP FSC.

MEMORY ALLOCATION

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus. If no nominal value is specified (only units), the stimulus becomes the value in MEM.

AUTOMATIC MESSAGES

The following messages will automatically be displayed by the system unless purposely defeated (see the ASK+ and ASK- FSC description):

- If the required connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections and press the ADV display key. If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to set the new range and function and then press the ADV display key. A range message is not produced for a Setup.

- If there is a pending MESS (see the MESS FSC Description), it is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

The DRAW FSC is used with the DISP, OPBR, EVAL, or SET FSCs and allows you to present a graphic representation of the UUT (with an annunciator) to the operator. The drawing (if used) appears on the Controller screen during a DISP, OPBR, EVAL, or SET. The DRAW FSC is used to describe the outline dimensions and image of the UUT to the system. The DISP, OPBR, EVAL, or SET FSCs use this description (with additional information supplied by that FSC) to show an operator an adjustment location or control feature of the UUT. The UUT drawing is described to the system with direct interaction of the Controller. The Parameters of this FSC are automatically computed from this interactively described drawing.

An example of the DRAW FSC is shown below:

```
STEP  FSC  RANGE NOMINAL   TOLERANCE  MOD1  MOD2  3  4  CON
1.002 DRAW       6 78 6 78            80 25 20 60
```

PARAMETERS

The following parameters apply to the DRAW FSC.

Nominal

Specifies a group of four numbers that indicate the size and position of the UUT, or the size and position of the UUT display on the Controller's screen. These numbers (parameters) are automatically inserted by the system after you have interactively entered the drawing's specifications. These parameters should not be manually entered (i.e., typed in) and are explained here for reference only.

The numbers entered under the Nominal field describe the rows and columns that the UUT drawing will occupy on the 1722A display. The first number is the UUT front top row and the second is the UUT front right column. The third and fourth numbers are the UUT side top row and right column. The bottom row and left column of both the front and side outlines are always in the same place.

MOD1---2

The numbers entered under the MOD1 field describe the size of the UUT drawing, and position of the UUT on the 1722A display. This information is stored as four numbers, with three character spaces used per number. These parameters are expressed as percentages and stored as ABCD. The parameters are defined in Figure 5-1.

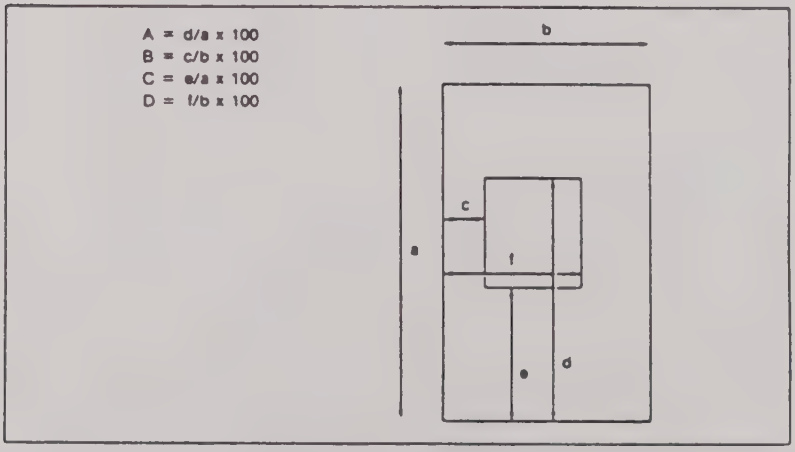

Figure 5-1. MOD1 Parameters for Size and Position of UUT Display

INTERACTIVE DISPLAY AND PROCEDURE

Figure 5-2 shows the display used during the interactive process. On this display is a rudimentary sketch of a generic UUT. The display keys presented on this screen allow you to move the lines of the generic UUT around until they resemble your specific UUT.

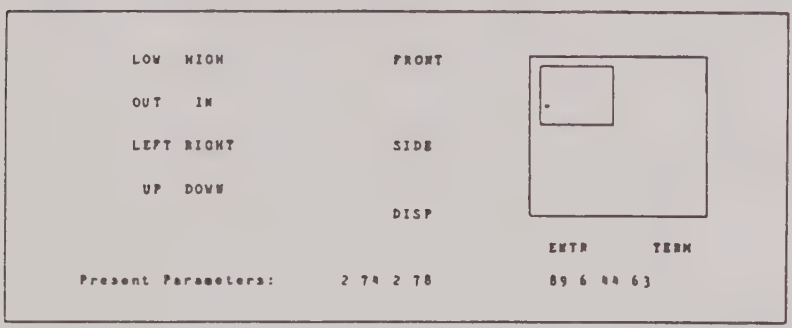

Figure 5-2. Interactive Display for Creating Draw Parameters

The first view shown is the front of the UUT. Pressing [LOW] will move the UUT drawing towards the bottom of the screen. Pressing [HIGH] will move the UUT towards the top of the screen. Once the basic shape of the UUT has been described press [SIDE] and repeat the same process to define the side view of the UUT.

The next step is press [DISP], and then describe the appearance of the UUT's display. When [DISP] is pressed, six new display keys are presented: [OUT], [IN], [LEFT], [RIGHT], [UP], and [DOWN]. The [LOW] and [HIGH] keys allow you to define the height of the UUT's display (lower or higher). The [OUT] and [IN] keys are used to define the length of the UUT display (either longer or shorter). The [UP], [DOWN], [LEFT], and

[RIGHT] keys are used to position the UUT display on the FRONT of the UUT. The current parameters are recalculated every time a display key is pressed. These parameters appear at the bottom of the screen beside the Present Parameters heading.

Pressing [ENTR] concludes this FSC entry. You may move from view to view using the [FRONT], [SIDE], and [DISP] keys. If a view is not changed, the default parameters apply. Pressing [TERM] terminates entry without saving the new parameters.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the DRAW FSC.

Memory Allocation

The contents of Memory is not changed with the DRAW FSC.

Automatic Messages

There are no automatic messages with the DRAW FSC.

Default

The default parameter for UUT size is 10 lines by 20 columns.

DESCRIPTION

The EVAL FSC allows you to present a message (to the operator) that requests a response. (The operator responds to the EVAL message using the [YES] or [NO] display key.) This response is then saved in the calibration test result record. An example of the EVAL FSC is shown below:

```
STEP  FSC  RANGE NOMINAL    TOLERANCE     MOD1      MOD2  3  4  CON
1.036 EVAL Is the {trace parallel} with the center horizontal line?
```

PARAMETERS

The following parameters apply to the EVAL FSC.

Range through CON

Specifies the text message of the EVAL FSC. All or part of the message line can be transferred to the Results file. The following rules apply to the EVAL FSC message line:

1. The line may contain up to 62 characters.

2. Any alphanumeric character is allowed.

3. Any part of the EVAL message line enclosed within braces is transferred literally to the results if the EVAL test is executed during the calibration.

4. Data included within braces is literally included in the results. For example:

{IS THE UUT READING [MEM] +/-2 DIGITS?}

will appear in the results as

IS THE UUT READING [MEM] +/-2 DIGITS?

Special Constructions

The EVAL FSC allows several special constructions to be used in its message line. The following paragraphs describe these special constructions and their use.

[MEM], [MEM1], and [MEM2]

The constructions [MEM], [MEM1], and [MEM2] will cause the value of the memory register in MEM, MEM1, or MEM2 to appear in the EVAL FSC message. For example:

IS THE UUT READING [MEM] +/-2 DIGITS?

will appear to the operator as

IS THE UUT READING 123.5 +/- 2 DIGITS

(When the procedure step was executed, the value contained in [MEM] was 123.5.)

[<numeric>]

The construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

[D<numeric>]

The construction [D<numeric>] will cause a delay of the message line by <numeric> number of microseconds. The available range is from 0 to 32767 microseconds.

[DRAW--,--,-]

The DRAW construction allows you to display a simple drawing of the UUT (with a blinking annunciator) to show the location of a control or an adjustment. This drawing will appear on the right side of the 1722A display screen. The DRAW construction includes three modifiers (par1, par2, and par3). The DRAW construction is entered as:

[DRAW<par1>,<par2>,<par3>]

The three modifiers (<par1>, <par2>, and <par3>) are optional but the commas must still be entered. These modifiers are used for the following purposes:

- The <par1> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of height from the bottom of the drawing.

- The <par2> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of width from the left side of the drawing.

- The <par3> modifier is used to indicate the desired view of the UUT, either front (F), back (B), left side (L), right-side (R), top (T), or bottom/underside (U).

Specifying 0 (zero) for <par1> and <par2> will cause the UUT drawing to be displayed without an annunciator.

Not specifying <par1> and <par2> (i.e., [DRAW,,par3]) will cause the UUT drawing to be displayed and then allow you to interactively describe the position of the annunciator. In this case the system software will display four arrow display keys ([UP], [DOWN], [LEFT], and [RIGHT]) that will allow you to position the annunciator.

The normal mode of operation for the procedure writer would be to enter only two commas. For example [DRAW,,F] would display the front of the DRAWING and allow the user to position the graphic annunciator.

ENTER concludes FSC entry, and the parameters will be automatically inserted.

USE OF BRACES AND SQUARE BRACKETS

Since braces and square brackets are reserved for special functions in the EVAL FSC, they cannot be used literally in a procedure line. The following constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).
- Use [93], to print a right square bracket (]).
- Use [123], to print a left brace ({).
- Use [125], to print a right brace (}).

MISCELLANEOUS

If there is a pending MESS FSC, its message is displayed followed by the EVAL message.

For memory applications, if the operator presses YES, MEM1 is assigned 1; if the operator presses NO, MEM1 is assigned -1.

The EVAL FSC is not allowed in an adjustment.

DESCRIPTION

The HEAD FSC is used to display an underlined header in the upper-left corner of the screen. The message remains there until another HEAD FSC is encountered. This header is used for presenting information and no operator action is required. An example of the HEAD FSC is shown below:

```
STEP  FSC   RANGE NOMINAL  TOLERANCE   MOD1   MOD2  3  4  CON
1.001 HEAD        DIRECT VOLTS TESTS
```

PARAMETERS

The following parameters apply to the HEAD FSC.

Nominal through CON

Specifies the text of the displayed, underlined heading. The following rules apply to the HEAD FSC underlined message:

1. A maximum of 56 characters is allowed for the heading.

2. Any alphanumeric characters may be used except for braces or square brackets (see below).

Special Constructions

The HEAD FSC uses several special constructions. The following paragraphs describe these special constructions and their use.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

[D<numeric>]

The special construction [D<numeric>] will cause a delay of the message line by <numeric> number of microseconds. The available range is from 0 to 32767 microseconds.

USE OF BRACES AND SQUARE BRACKETS

Braces {} and square brackets [] have the following special functions in the HEAD FSC:

- Any part of a HEAD message, enclosed by braces is transferred directly to the results file when that line is executed.

- Items within square brackets are not translated for the results file. For example,

  HEAD {FLUKE 8020A CALIBRATION [7]}

  will be displayed as

  FLUKE 8020A CALIBRATION (with a beep-tone)

and will be transferred to the results file as

HEAD {FLUKE 8020A CALIBRATION [7]}

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the HEAD FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left-hand square bracket ([).
- Use [93], to print a right-hand square bracket (]).
- Use [123], to print a left-hand brace ({).
- Use [125], to print a right-hand brace (}).

MISCELLANEOUS

The following paragraphs contain more information on the HEAD FSC.

Memory Allocation

The contents of Memory is not changed with the HEAD FSC.

Automatic Messages

There are no automatic messages with the HEAD FSC.

Removing the HEAD Message

The displayed HEAD message can be removed from the screen by entering another HEAD FSC with no message line. (Subsequent HEAD FSCs overwrite the preceding one.)

DESCRIPTION

The IEEE FSC allows you to communicate with any instrument that is connected to the IEEE-488 Interface Bus. This may include instruments that are in the System or any other instrument connected to the System's IEEE-488 Interface Bus. An example of the IEEE FSC is shown below:

```
STEP FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
     IEEE       [@124]VR1?[I][D500]?[I]
```

PARAMETERS

The following parameters apply to the IEEE FSC.

Nominal through CON

Specifies the IEEE-488 message string (which may also contain several special constructions). This message string must conform to the following rules:

1. A maximum of 56 characters is allowed for the IEEE message string.

2. A single IEEE FSC may use up to 300 lines.

3. Any part of the IEEE message string enclosed by braces will be transferred literally to the results file.

4. Alphanumeric characters are sent to the device most recently addressed. The string sent is terminated with an EOI (no CR or LF).

Special Constructions

There are several special constructions that expand the use of the IEEE FSC. These special constructions are explained in the following paragraphs.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be printed.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the corresponding ASCII character of the numeric to be printed. For example, [10] (ASCII character LF) will print a line feed to the addressed instrument.

[D<numeric>]

The special construction [D<numeric>] will cause a delay of the message line by <numeric> number of milliseconds. The available range is from 0 to 32767 milliseconds. This is useful for specifying a settling time for UUTs.

[@<primary address:secondary address>]

The special construction [@<primary address:secondary address>] specifies the receiving instrument's IEEE bus address. If only a primary address is specified, secondary addressing will not be used. If IEEE port 1 is used, add 100 to the instrument address. For example, if the instrument address is 1 (and the instrument is connected to IEEE port 1) it is addressed as [@101]. There is no preset default for addresses. Once an address is specified, it becomes the default

address until another address is assigned. A procedure line can specify a change of address within that single line.

[I]

The special construction [I] performs an input from the specified address. This function is similar to the BASIC statement INPUT @ <address>, <variable>. Data strings returned by a remotely controlled instrument normally contain just a numeric value. In a few cases units are also sent. The non-numeric characters are deleted from the string and the numeric value is stored as the contents of [MEM]. The existing content of [MEM] is overwritten.

[$I]

The special construction [$I] performs an input from the specified address. This function is similar to the BASIC statement INPUT LINE @ <address>, <variable>. The input is a numeric expression only, and it overwrites the contents of MEM2.

[T <numeric>]

The special construction [T <numeric>], sets IEEE timeout to the number of ms indicated by the numerical expression. The range is 0 to 32767 ms. If 0 timeout is specified, infinite timeout is assigned. The specified timeout remains in effect until another timeout is specified or a new IEEE FSC step is encountered.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the IEEE FSC:

- Any part of a IEEE message enclosed by braces is transferred directly to the results file when that line is executed.

- Items within square brackets are not transferred literally to the results file. For example:

```
IEEE {[@1] [MEM]v,n [D1000] [@24] ? [I]}
```

  Will be executed as (if MEM equals 1.23):

```
PRINT @1, '1.23 v,n';
WAIT 1000
PRINT @24, '?';
INPUT @24, CO(2)
```

  And will be transferred to the results file as:

```
[@1] [MEM]v,n [D1000] [@24] ? [I]
```

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the IEEE FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left-hand square bracket ([).
- Use [93], to print a right-hand square bracket (]).
- Use [123], to print a left-hand brace ({).
- Use [125], to print a right-hand brace (}).

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the IEEE FSC.

Memory Allocation

The contents of Memory is not changed unless [I] or [I$] is used. If [I] is used, the input data from the device is placed in MEM. If [I$] is used, the input data from the device is placed in MEM2.

Automatic Messages

There are no automatic messages with the IEEE FSC.

DESCRIPTION

The JMP FSC allows you to either unconditionally transfer control (jump) to another, designated procedure step (line) or to jump only on a pass/fail result. An example of the JMP FSC is shown below:

```
STEP   FSC RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
62.001 JMP                FAIL
```

PARAMETERS

The following parameters apply to the JMP FSC.

Nominal

Specifies the designated step (line) number of the jump. If no entry is made for Nominal, the system will jump to the End of the procedure. This jump will conclude the instrument's calibration test. The Nominal entry must conform to the following rules:

1. The Nominal entry must be between 1.001 and 299.999 (the procedure step limit).

2. If only the major step number of the procedure line is entered, the system will add the decimal minor step number .001.

Tolerance

Specifies whether or not the jump will be unconditional (Tolerance left blank) or on a pass/fail (PASS or FAIL is entered for Tolerance) basis. The following rules apply for unconditional or pass/fail conditional jumps:

1. If PASS is specified, the system jumps to the procedure line specified by Nominal if the UUT passes the test.

2. If FAIL is specified, the system the system jumps to the procedure line specified by Nominal if the UUT fails the test.

3. If Tolerance is left blank, the system will jump to the procedure line specified by Nominal.

MISCELLANEOUS

The following miscellaneous information applies to the JMP FSC:

- The system will automatically update Nominal (the procedure line number) as inserts or deletions are made to the calibration procedure.

- The Nominal will remain unchanged if the jump destination is deleted.

- If Nominal does not contain a valid destination, the next (numerically) valid procedure line is executed. If there is no valid line, after an invalid line, the system jumps to the End of the procedure.

DESCRIPTION

The JMPF FSC conditionally transfers control (jump) to another, designated procedure step (line) if MEM1 is less than zero or if the UUT does not match the name specified in the Tolerance through CON field. An example of the JMPF FSC is shown below:

```
STEP    FSC  RANGE NOMINAL TOLERANCE  MOD1 MOD2  3  4  CON
100.003 JMPF       3.001   Fluke 8024A
```

PARAMETERS

The following parameters apply to the JMPF FSC.

Nominal

Specifies the designated step number of the jump. If a jump condition is false, the system will continue its execution of the procedure at the designated step number. The Nominal entry must conform to the following rules:

1. The Nominal entry must be between 1.001 and 299.999 (the procedure step limit).

2. If only the major step number for the procedure line is entered, the system will add the decimal minor step number .001.

3. If Nominal is left blank, and a jump condition is true, the system will jump to the End of the procedure. This transfer concludes the instrument's calibration test.

Tolerance through CON

Specifies the UUT name (second jump condition). The Tolerance through CON entry must conform to the following rules:

1. If the field is blank, and jump condition is false (MEM1 is less than zero), the system will jump to the step number specified in Nominal.

NOTE

One use for this option is following an OPBR FSC (operator branch). If the operator presses YES, no branch will occur, if the operator presses NO, a branch will occur.

2. If this field contains the UUT name (selected for the procedure) a jump will occur.

NOTE

This option is useful if the procedure is written for multiple UUTs, and the procedure writer wishes to jump past certain tests of the procedure for some of the UUTs.

3. The system removes any leading blanks when the UUT name is entered. This ensures a proper match with the selected UUT name.

4. This field contains fewer characters than the INSTRUMENT field of the procedure header. If the instrument name (in the INSTRUMENT field) is longer than the field for the JMPF FSC, the comparison will be based only on the number of characters in the JMPT Tolerance through CON field.

5. If this field contains a UUT name, and this name matches the current UUT, no jump will occur. If the names do not match the system will jump to the designated procedure line.

MISCELLANEOUS

The following miscellaneous information applies to the JMPF FSC:

- The system will automatically update Nominal (the procedure line number) as inserts or deletions are made to the calibration procedure.
- The Nominal will remain unchanged if the jump destination is deleted.
- If Nominal does not contain a valid destination, the next (numerically) valid procedure line is executed. If there is no valid line, after an invalid line, the system jumps to the End of the procedure.

DESCRIPTION

The JMPT FSC conditionally transfers control (jump) to another, designated procedure step (line) if MEM1 is greater than zero or if the UUT matches the name specified in the Tolerance through CON field. An example of the JMPT FSC is shown below:

```
STEP   FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
61.001 JMPT                Fluke 8020A
```

PARAMETERS

The following parameters apply to the JMPT FSC.

Nominal

Specifies the designated step number of the jump. If a jump condition is true, the system will continue its execution of the procedure at the designated step number. The Nominal entry must conform to the following rules:

1. The Nominal entry must be between 1.001 and 299.999 (the procedure step limit).

2. If only the major step number for the procedure line is entered, the system will add the decimal minor step number .001.

3. If Nominal is left blank, and a jump condition is true, the system will jump to the End of the procedure. This transfer concludes the instrument's calibration test.

Tolerance through CON

Specifies the UUT name (second jump condition). The Tolerance through CON entry must conform to the following rules:

1. If the field is blank and the jump condition is true (MEM1 is greater than zero), the system will jump to the step number specified in Nominal.

   NOTE

   One use for this option is following an OPBR FSC (operator branch). If the operator presses YES, a branch will occur, if the operator presses NO, no branch will occur.

2. If this field contains the UUT name (selected for the procedure) a jump will occur.

   NOTE

   This option is useful if the procedure is written for multiple UUTs, and the procedure writer wishes to jump passed certain tests of the procedure for some of the UUTs.

3. The system removes any leading blanks when the UUT name is entered. This ensures a proper match with the selected UUT name.

4. This field contains fewer characters than the INSTRUMENT field of the procedure header. If the instrument name (in the INSTRUMENT field) is longer than the field for the JMPT, the comparison will be based only on the number of characters in the JMPT Tolerance through CON field.

MISCELLANEOUS

The following miscellaneous information applies to the JMPT FSC:

- The system will automatically update Nominal (the procedure line number) as inserts or deletions are made to the calibration procedure.

- The Nominal will remain unchanged if the jump destination is deleted.

- If Nominal does not contain a valid destination, the next (numerically) valid procedure line is executed. If there is no valid line, after an invalid line, the system jumps to the End of the procedure.

DESCRIPTION

The JMPZ FSC allows you to conditionally transfer control (jump) to another, designated calibration procedure line (if MEM1=0). If MEM1 does not equal 1, the next procedure line (the one following the JMPZ FSC) is executed.

```
STEP    FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
67.011  JMPZ       20.05
```

PARAMETERS

The following parameters apply to the JMPZ FSC.

Nominal

Specifies the line number of the calibration procedure that you wish to jump to. If no entry is made for Nominal, the system will jump to the End of the procedure. This jump will conclude the instrument's calibration test. If MEM1 is not equal to zero, this FSC is ignored and the system will jump to the End of the procedure. The Nominal entry must conform to the following rules:

1. The Nominal entry must be between 1.001 and 299.999 (the procedure line limit).

2. If only the major step number the procedure line is entered, the system will add the decimal minor step number .001.

MISCELLANEOUS

The following miscellaneous information applies to the JMP FSC:

- The system will automatically update Nominal (the procedure line number) as inserts or deletions are made to the calibration procedure.
- The Nominal will remain unchanged if the jump destination is deleted.
- If Nominal does not contain a valid destination, the next (numerically) valid procedure line is executed. If there is no valid line, after an invalid line, the system jumps to the End of the procedure.

DESCRIPTION

This FSC programs the Fluke 6060B (or A) Synthesized Signal Generator to provide modulation (AM, FM). All modulation functions programmed by previous M606 FSC's are cumulative until a reset ('*' in the nominal field is encountered. The modulation functions are invoked on the next occurrence of the 6060 FSC. An example of the M606 FSC is shown below:

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.006	M606		1KH		100H				

PARAMETERS

The following parameters apply to the M606 FSC.

NOMINAL

Specifies the nominal value for the test. The nominal specifies the general mode of the test as well as the primary parameter. The form of the nominal value is:

<nominal><prefix> H or T

The nominal typically specifies the modulation frequency to be programmed. If just <prefix> H or T are present, the modulation frequency is the value of MEM.

PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by H (frequency in Hz) or T (period in seconds). There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	M 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

VALUES

The nominal and its units may contain up to 14 characters. The allowed nominal values are defined as follows:

AM MODULATION

FREQUENCY RANGE (6060 FSC) (MH)	AM FREQUENCY	AM DEPTH
10 kHz to 1050 MH	400H or 1000H	0 - 90%

FM MODULATION

FREQUENCY RANGE fo	MODULATION FREQUENCY	MAXIMUM DEVIATION ACFM (the lesser of) fm
10 kHz to 0.4 MHz	400 Hz or 1000 Hz	(100 Hz to 99.9 kHz) and (fo-100/1000)/3
0.4 MHz to 245 MHz	400 Hz or 1000 Hz	(100 Hz to 99.9 kHz) and (2 fm(fo + 800))
245 MHz to 1050 MHz	400 Hz or 1000 Hz	(100 Hz to 99.9 kHz) and 2 fm fo

Where: fo is the frequency in MHz and
fm is the modulation frequency in kHz

- A nominal of '*' sets the 6060 modulation and sweep to standby, and clears all pending M606 functions. If a carriage return with no data is entered, a '*' is assigned.

- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Range is not used.

Tolerance

Tolerance is not used.

MOD1

Specifies the modulation index. To specify the modulation index, the entry is:

FM: <Max freq dev> <units> H or T Deviation in Hz or Sec
AM: <AM Index> <units> % Depth in %

- The prefixes may be p, n, u, m, K, M, or G. There is an automatic translation of prefixes that allows the use of upper case letters. This automatic translation is defined as follows:

Entered	Assigned
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H)
m or M	M 10^{-3} (if not H)
k or K	K 10^{3}
M	M 10^{6} (if H)
g or G	G 10^{9}

- The MOD1 field may be up to 14 characters in length.
- Refer to the tables under the nominal section for appropriate parameter limits.

MOD2

MOD2 is not used.

MOD3

MOD3 is not used.

MOD4

MOD4 is not used.

CON

Connection is not used.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the M606 FSC.

MEMORY ALLOCATION

If no nominal is specified (only units), the nominal becomes the value in MEM.

AUTOMATIC MESSAGES

The M606 FSC does not use automatic messages.

USE OF MEM AS NOMINAL

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 6060A.

VERIFICATION

Because the Procedure Generator/Editor cannot be aware of the 6060 amplitude or frequency, a complete verification of the parameter entry cannot be automatically performed. Because of this, the operator should be cognizant of the parameters being used when this FSC is selected.

DESCRIPTION

The MEM* FSC allows you to multiply the contents of MEM by the value specified in Nominal, or it multiplies the contents of MEM1 by the value contained in MEM. The product of either method is placed in MEM. An example of the MEM* FSC is shown below:

```
STEP     FSC  RANGE NOMINAL   TOLERANCE  MOD1  MOD2  3  4  CON
2.003    MEM*       100
```

PARAMETERS

Nominal is the only parameter field used for the MEM* FSC. The following paragraphs describe the use of the Nominal parameter field for the MEM* FSC.

NOMINAL

Specifies the number to be multiplied by the value in MEM. If Nominal is left blank, the value of MEM is multiplied by the value in MEM1. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal number, or remain blank.

DESCRIPTION

The MEM/ FSC allows you to divide the value of MEM by a certain number (specified in Nominal) or divide the value of MEM1 by the value in MEM. The quotient of either method is placed in MEM. An example of the MEM/ FSC is shown below:

```
STEP    FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
56.003  MEM/       1000
```

PARAMETERS

Nominal is the only parameter field used for the MEM/ FSC. The following paragraphs describe the use of the Nominal parameter field for the MEM/ FSC.

NOMINAL

Specifies the number that MEM will be divided by. If Nominal is left blank, the value in MEM is divided by the value in MEM1, and the quotient is placed in MEM. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal number, or be blank.

3. If the divisor is zero (in either method) no division takes place and an error message is displayed to the operator.

DESCRIPTION

The MEM+ FSC allows you to add the Nominal value to the value of MEM, or add the value of MEM1 to MEM. The sum of either method is placed in MEM. An example of the MEM+ FSC is shown below:

```
STEP    FSC   RANGE NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON
23.004  MEM+        25.27
```

PARAMETERS

Nominal is the only parameter field used for the MEM+ FSC. The following paragraphs describe the use of the Nominal parameter field for the MEM+ FSC.

NOMINAL

Specifies the number to be added to the value in MEM. If Nominal is left blank, the value of MEM is added to the value in MEM1. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal number, or be blank.

DESCRIPTION

The MEM- FSC allows you to subtract the Nominal value from the value in MEM or subtract the value of MEM1 from MEM. The difference of either method is placed in MEM. An example of the MEM- FSC is shown below:

```
STEP   FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
2.008  MEM-       1.073
```

PARAMETERS

Nominal is the only parameter field used for the MEM- FSC. The following paragraphs describe the use of the Nominal parameter field for the MEM- FSC.

NOMINAL

Specifies the number to be subtracted from the value in MEM. If Nominal is left blank, the value of MEM is subtracted from the value in MEM1. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal, or be blank.

DESCRIPTION

The MEM2 FSC allows you to manipulate the contents of the MEM2 memory register. (MEM2 is a 16-character memory string location.) It can be used to store other information for Message FSCs or to request operator input to memory register MEM2. The MEM2 FSC may also be used to directly enter data to memory register MEM2.

An example of the MEM2 FSC is shown below:

```
STEP    FSC   RANGE NOMINAL  TOLERANCE  MOD1 MOD2  3  4  CON
14.004  MEM2        =Channel 1
```

PARAMETERS

The following parameters apply to the MEM2 FSC.

Nominal through Tolerance

Specifies the message or memory contents string. If the string is prefaced with an equals sign, the message will be transferred directly to memory register MEM2. The equals sign will not be transferred.

If the string is not prefaced with an equals sign, that string becomes an operator prompt. The operator is shown the message and the Touch-Sensitive display is presented. The operator's response is transferred directly to memory register MEM2. If there is no operator entry, the contents of memory register MEM2 is blank.

Special Constructions

There are several special constructions that expand the use of the MEM2 FSC. These special constructions are explained in the following paragraphs.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the corresponding ASCII character of the numeric to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the MEM2 FSC:

- Any part of a MEM2 message, enclosed by braces, is transferred literally to the results file when that line is executed.

- Items within square brackets are not translated for the results file. For example (MEM = 12.01):

  ```
  MEM2 ={[MEM] VOLTS/DIV}
  ```

  assigns 12.01 VOLTS/DIV to MEM2, but goes into the results as:

  ```
  [MEM2] VOLTS/DIV
  ```

  If the assignment or prompt is greater than 16 characters, it will be truncated to 16 characters when printed.

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the MEM2 FSC, they cannot be used literally in a procedure line. The following constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).
- Use [93], to print a right square bracket (]).
- Use [123], to print a left brace ({).
- Use [125], to print a right brace (}).

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the MEM2 FSC.

Memory Allocation

The contents of memory register MEM2 is replaced by the value entered by the operator. If the operator does not enter a value, the contents of MEM2 will be 0 (zero).

Automatic Messages

If the MEM2 string is not prefaced with an equals sign, the system will automatically display the Touch-Sensitive display to the operator.

DESCRIPTION

The MEMC FSC instructs the system to compare the UUT Nominal value to the value of MEM, or compare MEM1 to MEM, and generate a test result based on the comparison. The MEMC FSC is not allowed in an adjustment test. An example of the MEMC FSC is shown below:

```
STEP   FSC   RANGE  NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON
3.001  MEMC  10     Volts   1% 1/      100H
```

PARAMETERS

The following parameters apply to the MEMC FSC:

Nominal

Specifies the values that will be compared. If the Nominal contains just units (i.e., V, Volts, A, Z, etc.), the system stimulus (which is the value stored in MEM) is compared to the UUT reading (which is the value stored in MEM1). If the Nominal contains a numeric value, the system stimulus is compared to the UUT reading (as specified in the Nominal field).

ALLOWED UNITS

The following units are allowed for the MEMC Nominal value:

VOLTS	AMPS	DECIBELS	DEGREES (TEMP.)	RESISTANCE
V	A	D	Degrees C	Z
Volts	Amps	Decibels	Degrees F	Ohms

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

VOLTS	AMPS (dc)	OHMS	SIEMENS	DECIBELS	MULTIPLIER
V	A	Z	Y	D	1
pV or PV	pA or PA	pZ or PZ	pY or PY	pD or PD	10^{-12}
nV or NV	nA or NA	nZ or NZ	nY or NY	nD or ND	10^{-9}
uV or UV	uA or UA	uZ or UZ	uY or UY	uD or UD	10^{-6}
mV or MV	mA or MA		mY or MY	mD or MD	10^{-3}
kV or KV	kA or KA	kZ or KZ	kY or KY	kD or KD	10^{3}
		mZ or MZ			10^{6}
gV or GV	gA or GA	gV or GZ	gY or GY	gD or GD	10^{9}

- A maximum of 14 characters is allowed for the Nominal value plus units.
- The numeric of the Nominal value may contain signed numbers and decimal points.
- The units of the Nominal Value may not contain any numerics and must not be terminated with any of the following characters: R, /, U, or %.

Range

Specifies the UUT range for the purpose of computing the percentage of range tolerance. The Range parameter is entered as:

<range>R

After the line has been read and verified by the system, the R is removed (from the procedure record).

- Range may be up to five characters long.
- No range or function messages are generated for this FSC.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the Nominal value (if entered) or as a percentage of MEM1.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Tolerance as an absolute value (units are the same as those used for Nominal or MEM1).

- If the tolerance is unsigned, the system defaults to +/- tolerance.

- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.

- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.

- Percentage of range (% of range)/ or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

The MOD1 field is transferred directly to the results. The field may be up to 14 characters in length and must not end in an R, /, %, or U. This parameter may be used as an additional description of the test such as frequency.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the MEMC FSC.

MEMC is not allowed in an adjustment.

Memory Allocation

Neither MEM or MEM1 is modified by the MEMC FSC.

Automatic Messages

There are no automatic messages produced by the MEMC FSC.

DESCRIPTION

The MCAL FSC programs the Tektronix CG5001AP Programmable Calibration Generator to provide those special functions not available in the 5001 FSC. These special functions will remain in effect until they are disabled by another MCAL FSC. This FSC is not evaluated and is transparent to the operator.

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
34.002	MCAL		50P		15,0E	M	N		

PARAMETERS

The following parameters apply to the MCAL FSC.

Nominal

Specifies the minimum repetition rate that the CG5001 is allowed to use for the Markers mode before switching to the Slewed Edge mode. This value is entered by:

<rep. rate>P

- The allowed values are expressed in nanoseconds and may be 10, 20, 50, 100, or 200.
- If no value is entered, the default value of 10P is automatically entered.

Range

Range is not used.

Tolerance

Tolerance is not used.

MOD1

Specifies the number of edges and how far the first edge is shifted from the trigger pulse for the Slewed Edge mode. These values are entered by:

<no. edges>,<no. shifts>E

- The allowed values for the number of edges are integers ranging from 1 to 15.
- The allowed values for the number of shifts are integers ranging from -99 to +99.
- If no value is entered for the first parameter (no comma is entered), then a default value of 15,<no. shifts>E is entered.
- If no value is entered for the second parameter, then a default value of <no. edges>,0E is entered.
- If no value is entered at all, then a default value of 15,0E is entered.

MOD2

Specifies that every tenth pulse of the Marker mode is to be accentuated. This function is entered by an M in this field. If nothing is entered then the Magnifier is disabled. M may be used with 5001 nominals >1 us or $T<10^{6}$.

MOD3

Specifies whether narrow markers should be used for slow marker repetition rates. The narrow markers

function is entered by an N in this field. If nothing is entered, the markers are returned to their normal widths. N may be used with 5001 nominals from 10 us to 5 seconds.

MOD4

Specifies a 100-nanosecond delay between the trigger and the fast-edge pulse. The delay is useful for oscilloscopes that have no internal delay between the trigger and vertical amplifier inputs. This function is entered by a D in this field. If nothing is entered then the delay is disabled.

CON (connection)

Connection. Specifies the Trigger Rate for every mode except Slewed Edge. This value is entered by:

<parameter>T

The allowed values are integers that range from 0 to 3. These parameters have the following meaning:

0 - Turn off the trigger
1 - Turn on trigger in Normal mode
2 - Turn on trigger at X.1 of output rate
3 - Turn on trigger at X.01 of output rate

If nothing is entered the default is 1T.

MISCELLANEOUS

Memory Allocation

Memory is not changed.

Automatic Messages

There are no automatic messages.

Memory Locations

Twenty additional numeric locations have been allocated in addition to the originally provided MEM and MEM1. These are accessed via the MEME (MEMory Exchange FSC).

Synopsis

The procedure writer can use the MEMI FSC to prompt the operator to enter a numeric value into MEM. The procedure writer uses the MEME FSC to move the value in MEM to a software register for later use. During procedure execution, the operator is prompted to enter the numeric value into MEM via a touch sensitive keypad that appears on the 1722A's CRT. Via the MEME FSC, the procedure replicates this value in one or more specified memory locations. Later, the procedure is directed to this location and replicates the value therein back into MEM.

Procedure Generation

During procedure generation, the procedure writer selects the MEME FSC and stipulates the location to store a numeric value. After selecting MEME FSC the procedure writer enters >nn on the highlighted prompt line (where nn is the number of the specified memory location). In order to load the value of one of the memory locations into MEM, the procedure writer uses the MEME FSC and enters <nn on the highlighted prompt line (where nn is the number of the specified memory location).

Notes

- nn is a positive integer from 1 to 20 inclusive.
- The present value in MEM is not affected by the >nn operation.
- The present value in MEM is overwritten by the <nn operation.
- The present value in the location is overwritten by the >nn operation.
- The present value in the location is not affected by the <nn operation.
- The present value of MEM1 is not affected by use of a '1' in either the >nn or <nn operation.

Application Example

The operator enters a numeric value for later use. For example, the operator may be be given 10 sequential prompts to enter the values of 10 standard cells into MEM via the 1722A's touch sensitive CRT. The MEME FSC will load these 10 values into 10 locations. Later, the DISP, MEME MEM+ and 5440 FSC's are used to prompt the operator to sequentially connect the cells in series, obtain a running total of these values and use this running total to test the accuracy of a Fluke 5440B on its 10V range.

DESCRIPTION

The MEME FSC stores a number in memory register MEM or exchanges the contents of MEM with the contents of MEM1. An example of the MEME FSC is shown below:

```
STEP  FSC  RANGE  NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
4.002 MEME        -10.71
```

PARAMETERS

Nominal is the only parameter field used for the MEME FSC. The following paragraphs describe the use of the Nominal parameter field for the MEME FSC.

NOMINAL

Specifies the number to be stored in the MEM memory register. If Nominal is left blank, the contents of MEM1 is exchanged with the contents of MEM. The Nominal entry must conform to the following rules:

1. A maximum of 14 characters is allowed for the Nominal entry.

2. The Nominal entry must be an integer, a decimal number, or be blank.

DESCRIPTION

The MEMI FSC displays a message to the operator which asks for a number to be entered using the Touch-Sensitive display. The number entered by the operator is placed in MEM. An example of the MEMI FSC is shown below:

```
STEP  FSC   RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
      MEMI        Enter the reading on the UUT:
```

PARAMETERS

The following paragraphs describe the use of the parameter fields for the MEMI FSC.

Nominal

Specifies the message to be displayed to the operator. The message may contain any alphanumeric characters within the following guidelines:

1. The message line may contain a maximum of 56 characters.

2. The construction, [<numeric>] will cause the ASCII character that corresponds to the numeric within the square brackets, to be printed. For example, [7] (ASCII control character BEL) will cause the 1722A bell to ring.

3. The construction, [D<numeric>] will cause a delay of <numeric> in milliseconds. The <numeric> must be between 0 and 32767 (i.e., 0 to 32767 milliseconds).

4. The constructions [MEM], [MEM1], and [MEM2] (brackets included) will cause the value of the memory register in MEM, MEM1, or MEM2 to appear in the MEMI FSC message. Items within square brackets are not transferred literally to the results. For example, if MEM contains 123.4 and the message line is entered as:

   MEMI {STIMULUS IS [MEM]-ENTER UUT READING}

   It is interpreted as:

   0 1 2 3 4 5 6 7 8 9

   E - DELT ENTR

   STIMULUS IS 123.4-ENTER UUT READING_____

   And will appear in the results as:

   STIMULUS IS [MEM]-ENTER UUT READING

5. Braces ({ and }) or square brackets ([and]) cannot be used literally since they are reserved for special functions. To print a brace or square bracket in a MEMI FSC message line, the following codes must be used:

   a. To print [(right-square bracket), use [91].

   b. To print] (left-square bracket), use [93].

   c. To print { (left-brace), use [123].

   d. To print } (right-brace) use [125].

6. Any part of the message line enclosed within braces will be automatically and literally transferred to the results if that line is associated with the MEMI and is executed during the calibration.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the MEMI FSC.

Memory Allocation

The contents of memory register MEM is replaced by the value entered by the operator. If the operator does not enter a value, the contents of MEM will be 0 (zero).

Automatic Messages

There are no automatic messages with the MEMI FSC.

DESCRIPTION

The MESS (Measurement Setup, Evaluation, and Stimulus) FSC stores message lines to be displayed prior to one of the following types of messages: a stimulus instrument slew message, a PRESENT MEASUREMENT IS... message, or an EVAL message.

This FSC is used during stimulus FSCs to supplement the slew message or to replace it entirely. (To replace the automatic slew message, enter the desired slew message with MESS, and then suppress the automatic message with AN ASK-N.) For message FSCs, the MESS FSC message only appears prior to the PRESENT MEASUREMENT IS ... message. For Setup tests (MOD4=S), the automatic message cannot be suppressed. However, it can be used to inform the operator what adjustment must be made. During an Evaluation test (MOD4=blank), the MESS FSC message is displayed prior to the EVAL FSC line.

An example of the MESS FSC is shown below:

```
STEP  FSC   RANGE  NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
7.005 MESS         When the CH1 VAR VOLTS/DIV control is rotated
7.005 MESS         from one extreme to the other is
                   {CH1 UNCAL LED on}?
```

PARAMETERS

The following parameters apply to the MESS FSC.

Nominal through CON

Specifies the text of the MESS message line. The message line must conform to the following rules:

1. A maximum of 56 characters is allowed for the MESS message line.

2. Any alphanumeric characters may be used except for braces or square brackets (see below).

3. A MESS message must be erased after it is used. Enter a blank MESS FSC line to erase a previous MESS FSC line. (This is because the MESS line remains active until another MESS FSC is encountered.)

Special Constructions

The MESS FSC uses several special constructions that expand its use. The following paragraphs describe these special constructions and their use.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed to the operator. Remember, the value used for MESS is the value contained in MEM1 when the MESS FSC line is executed, not when the MESS data is used.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the MESS FSC:

- Any part of an MESS message enclosed by braces is transferred directly to the results file when that line is executed.

- Items within square brackets are not translated for the results file. For example, if MEM contains 23.4, the line:

  ```
  MESS {ADJUST STIMULUS FOR [MEM] DEGREES C }
  ```

  would be interpreted as:

  ```
  ADJUST STIMULUS FOR 23.4 DEGREES C
  ```

  And be stored in the results as:

  ```
  ADJUST STIMULUS FOR [MEM] DEGREES C
  ```

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the MESS FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).

- Use [93], to print a right square bracket (]).

- Use [123], to print a left brace ({).

- Use [125], to print a right brace (}).

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the MESS FSC.

Memory Allocation

The contents of Memory is not changed with the MESS FSC.

Automatic Messages

There are no automatic messages with the MESS FSC.

DESCRIPTION

The MGEN FSC programs the Fluke 6070A/6071A Synthesized Signal Generator to provide modulation (AM, FM, Phase) or sweep. All sweep or modulation functions programmed by previous MGEN FSCs are cumulative until a reset ('*' in the nominal field) is encountered. The combination of sweep and modulation functions is invoked on the next occurrence of the 6070 or 6071 FSC.

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	MGEN		+1KH		100HS		2D		

PARAMETERS

The following parameters apply to the MGEN FSC.

Nominal:

Specifies the nominal value for the test. The nominal specifies the general mode of the test as well as the primary parameter. The form of the nominal value is:

<nominal><prefix><units> (where <units> is H or T)

The nominal typically specifies the modulation frequency to be programmed. If just H or T is present, the modulation frequency is the value of MEM. If MOD1 units are HS, the nominal specifies the sweep width. If MOD1 units are HS and the nominal value is preceded by a + or -, an asymmetrical frequency sweep is specified. The + indicates starting at the nominal frequency specified in the 6070/6071 FSC and sweeping upward for the frequency specified in this field. A -

prefix indicates starting at the nominal frequency of the 6070/6071 FSC and sweeping downward for the frequency specified in this field. A symmetrical sweep (no + or - prefix) starts at one-half the sweep frequency below the 6070/6071 base frequency and sweeps up to one-half the sweep frequency above the 6070/6071 frequency. The nominal value must be entered before the MOD1 value.

ALLOWED PREFIXES

The allowed prefixes are: none, p, n, u, m, K, M, or G, followed by H (frequency in Hz) or T (period in seconds). There is an automatic translation of units that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H or HS)
m or M	m 10^{-3} (if not H or HS)
k or K	K 10^{3}
M	M 10^{6} (if H or HS)
g or G	G 10^{9}

ALLOWED VALUES

The allowed nominal values are defined as follows:

AM MODULATION

FREQ. RANGE (MH) 6071 FSC	AM FREQ.	AM DEPTH
0.2 to 5	20H to 8 kH	<=90
5 to 520	20H to 50 kH	<=90
520 to 1040	20H to 50 kH	<=70

FM MODULATION

FREQ. RANGE (6071 FSC) (MH)	ALLOWED MODULATION FREQUENCY	MAXIMUM PEAK FREQ DEVIATION ACFM the lesser of: (KH)
0.2 to 62.5	0.02 to 199 kHz	999 or (*fm) (520-**fo)
62.5 to 125	0.02 to 199 kHz	199 or (fm) (fo)
125 to 250	0.02 to 199 kHz	499 or (fm) (fo)
250 to 520	0.02 to 199 kHz	999 or (fm) (fo)
520 to 1040	0.02 to 199 kHz	999 or (fm) (fo)

*fm = modulation frequency in kH.
**fo = RF output frequency in MH.

PHASE MODULATION

FREQ. RANGE (6071 FSC) (MH)	MODULATION FREQUENCY	MAX PEAK PHASE DEVIATION (RADIANS)
0.2 to 62.5	20H through 11.9 kH	99.9
62.5 to 125	20H through 11.9 kH	19.9
125 to 250	20H through 11.9 kH	49.9
250 to 1040	20H through 11.9 kH	99.9

- The nominal field may contain up to 14 characters.

- A nominal of * sets the 6070A/6071A modulation and sweep to standby, and clears all pending MGEN functions. If a carriage return with no data is entered, a * is assigned.

- If just nominal units are entered, the nominal will be that of MEM plus the units specified.

Range

Range is not used.

Tolerance

Tolerance is not used.

MOD1

Specifies the modulation index or the sweep increment.

To specify the modulation index, the entry is:

FM:	<Peak frequency deviation><prefix>H or T	Deviation in Hz or Sec
AM:	<AM Index><prefix>%	Depth in %
Phase:	<Phase Index><prefix>R	Deviation in Radians

To specify sweep step size, the entry is:

<step size><prefix>HS	Step size in Hz

Sweep step size has 1H resolution up to 520MH and 2H resolution up to 1.04GH, and must be less than the sweep width.

- The units may be p, n, u, m, K, M, or G. There is an automatic translation of units that allows the use of upper-case letters. This automatic translation is defined as follows:

ENTERED	ASSIGNED
p or P	p 10^{-12}
n or N	n 10^{-9}
u or U	u 10^{-6}
m	M 10^{6} (if H or HS)
m or M	m 10^{-3} (if not H or HS)
k or K	K 10^{3}
M	M 10^{6} (if H or HS)
g or G	G 10^{9}

- The MOD1 entry may be up to 14 characters in length, including the units and type (H, HS, %, T, or R).

- Refer to the tables under the nominal section for appropriate parameter limits.

MOD2

MOD2 is not used.

MOD3

Specifies the sweep delay between increments. This entry is only made in the sweep mode (MOD1 is specified in HS) and only if a delay between sweep increments is required (the default is no delay). The allowed entries are:

ENTRY	RESULT
(blank)	No delay in fast sweep.
0D	0 ms in slow sweep.
1D	50 ms in slow sweep.
2D	100 ms in slow sweep.
3D	200 ms in slow sweep.
4D	500 ms in slow sweep.

MOD4

MOD4 is not used.

CON (connection)

Connection is not used.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the MGEN FSC.

Memory Allocation

If no nominal value is specified (only units), the nominal becomes the value in MEM.

Automatic Messages

There are no automatic messages.

Use Of MEM As Nominal

When using no nominal value (i.e., using the value of MEM), the Procedure Generator/Editor cannot verify the correctness of the entry; therefore, ensure that MEM contains a valid parameter for the 6070A/6071A.

Verification

Because the Procedure Generator/Editor cannot be aware of the 6070/6071 amplitude or frequency, a complete verification of the parameter entry cannot be automatically performed. Because of this, the operator should be cognizant of the parameters being used when this FSC is selected.

DESCRIPTION

The OPBR FSC is used to display a message to the operator that is up to eight lines long and requests a yes or no answer. The operator's response is stored as an integer value in MEM1. (A yes answer is equal to 1, a no answer is equal to -1.) The OPBR FSC is useful for causing operator-prompted branching and for testing UUT options in conjunction with the JMPT and JMPF FSCs. It can also be used to set MEM1 to a plus or minus 1 value for use with memory math functions. An example of the OPBR FSC is shown below:

```
STEP  FSC  RANGE  NOMINAL  TOLERANCE    MOD1    MOD2  3  4  CON
4.001 OPBR Would you like to turn-off automatic range messages?
```

PARAMETERS

Message FSCs utilize the entire Step line from Nominal to CON for their parameters. The Range field is not used in Message FSCs. The parameter fields for the OPBR FSC are used as follows:

Text Messages

Text messages are entered exactly as they are to be read (up to eight lines of 56 characters per OPBR FSC), with the following exceptions. Square ([and]) or curly ({ and }) brackets cannot be entered literally since they are used to define special constructions for the DISP FSC. (See Special Constructions.) Use the [CONT] display key to enter a message that is longer than one line. (Each additional line will have the same Step number).

Special Constructions

The OPBR FSC uses several special constructions that expand its use. The following paragraphs describe these special constructions and their use.

DRAW

The DRAW construction allows you to display a simple drawing of the UUT (with an blinking annunciator) to show the location of a control or an adjustment. This drawing will appear on the right side of the 1722A display. The DRAW construction includes three modifiers (par1, par2, and par3). The DRAW construction is entered as:

[DRAW,<par1>,<par2>,<par3>]

The three modifiers are optional however, the commas must still be entered. The modifiers are used for the following purposes:

- The <par1> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of height from the bottom of the drawing.

- The <par2> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of width from the left side of the drawing.

- The <par3> modifier is used to indicate the desired view of the UUT, either front (F), back (B), left side (L), right-side (R), top (T), or bottom/underside (U).

Specifying 0 (zero) for par1 and par2 will cause the UUT drawing to be displayed without an annunciator. Not specifying par1 and par2 (i.e., DRAW,,par3) will cause the UUT to be displayed and then allow you to interactively describe the position of the annunciator.

In this case the system software will display four arrow display keys (Up, Down, left, and Right) that will allow you to position the annunciator.

The normal mode of operation for the procedure writer would be to enter only two commas. For example [DRAW,,F] would display the front of the DRAWING and allow the user to position the graphic annunciator. ENTER concludes FSC entry, and the parameters will be automatically inserted.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

[D<numeric>]

The special construction [D<numeric>] will cause a delay of the message line by <numeric> number of milliseconds. The available range is from 0 to 32767 milliseconds.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the OPBR FSC:

- Any part of an OPBR MESS message enclosed by braces is transferred directly to the results file when that line is executed.

- Items within square brackets are not translated for the results file. For example, the following line:

  ```
  OPBR  DO YOU WISH TO PERFORM {[D1000] LO OHMS TESTS?}
  ```

  will be displayed as:

  ```
  DO YOU WISH TO PERFORM (A DELAY OF 1000 msec
  then occurs) LO OHMS TESTS?
  ```

  and will be transferred to the results file as:

  ```
  [D1000] LO OHMS TESTS
  ```

- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).

Since braces and square brackets are reserved for special functions in the OPBR FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).

- Use [93], to print a right square bracket (]).

- Use [123], to print a left brace ({).

- Use [125], to print a right brace (}).

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the OPBR FSC.

Memory Allocation

The contents of Memory is changed as follows with the OPBR FSC:

- MEM1 is set to 1 (one) if the operator responds with [YES] to the displayed question.
- MEM1 is set to -1 (negative-one) if the operator responds with [NO] to the displayed question.

Automatic Messages

There are no automatic messages with the OPBR FSC.

DESCRIPTION

The PORT FSC performs a transfer of data through the RS232 port of the 1722A or 1720A. An example of the PORT FSC is shown below:

```
STEP FSC RANGE  NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON

     PORT       [#1]VR1?[I][D500]?[I]
```

PARAMETERS

Range

Range is not used.

Nominal-Connection

This FSC contains a line of alphanumeric characters which may include the following special constructs:

- o [<numeric>] Prints the ASCII character corresponding to the numerical expression within the brackets. For example, [10] will print a line feed to the addressed instrument.
- o [D<numeric>] Delays the number of ms indicated by the numerical expression during the display of the line. The range is 0-32767 ms of delay. [D10] will delay 10 ms. This delay can be used to ensure instrument settling.
- o [MEM] Prints the value of MEM.
- o [MEM1] Prints the value of MEM1.

- [MEM2] Prints the value of MEM2.

- [#<numeric>] Specifies the PORT number to transmit or receive data (PORT numbers may be either 1 or 2).

- [I] Performs an input from the specified port. Data strings returned by remotely controlled instruments normally just contain a numeric value. In a few cases units are also sent.

  The non-numeric units are filtered out from the string and the numeric value is stored in [MEM].

- [I$] Performs an input from an PORT device and places that input into MEM2.

- { } Any part of the line within braces will automatically be transferred literally to the results if that line is executed during the calibration.

- Each line may be up to 56 characters long. During execution, neither braces nor square brackets ([ ]) will be printed. Since this scheme prevents directly printing [,], {,and}, they may be printed by:

  [[91]

  ] [93]

  { [123]

  } [125]

- Items within square brackets are not translated for the results.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the PORT FSC.

MEMORY ALLOCATION

The memory locations are unchanged unless an [I] is executed, in which case the input is placed in MEM or an [I$] is executed in which case the input is placed in MEM2.

AUTOMATIC MESSAGES

There are no automatic messages.

CONTINUATION

Any number of PORT line continuations are allowed, each up to 56 characters long. It is recommended that the procedure writer use the continue feature whenever possible to enhance speed.

DESCRIPTION

The RESF FSC instructs the system to provide a fixed resistance stimulus from the 5100B Calibrator or the Test Interface panel (in the case of a 7405A system) to the UUT. An example RESF FSC is shown below:

```
STEP   FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
29.001 RESF 200   100KZ    .23U                        2W
```

PARAMETERS

The following parameters apply to the RESF FSC.

Nominal

Nominal value for the test. This parameter is the resistance stimulus programmed. If it is a Setup test, the next procedure record is directly executed; otherwise, the operator is shown the nominal value and asked to slew the display until it matches the UUT readout. The nominal is entered by:

<nominal><prefix><units>

ALLOWED VALUES

The values allowed for nominal are:

Resistance in ohms (Z)

1Z to 10 MZ (in decade steps)

1.9Z to 19MZ (1.9 decade steps, 7405A only)

Conductance in siemens (Y)

1Y to .1 uY (in decade steps)

0.52631Y to 52.631nY (in increments of X10, 7405A only)

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

OHMS	SIEMENS	VALUE
Z	Y	value of integer
pZ or PZ	pY or PY	10^{-12}
nZ or NZ	nY or NY	10^{-9}
uZ or UZ	uY or UY	10^{-6}
mZ	mY or MY	10^{-3}
kZ or KZ	kY or KY	10^{3}
MZ		10^{6}
gZ or GZ	gY or GY	10^{9}

- A maximum of 14 characters is allowed for the Nominal value plus units.
- A Nominal value of * (asterisk) sets the 5100B to Standby and opens the TI panel relays (7405A only). This test is a Setup test, so MOD4 will automatically be assigned as S.
- If a <RETURN> is entered, with no additional data, an * (asterisk) is implied.
- If units are entered without a Nominal value (e.g., Z), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal value. The UUT range is entered as:

<range>R

After the line has been read and verified by the system, the R is removed (from the procedure record).

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range> data, no automatic range message will occur.
- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters is allowed for the tolerance specification. Any combination of the following entries (within the 13-character limit) may be used:

ENTRY	SPECIFICATION TYPE
<% of nominal>%	Tolerance as a percentage of the nominal value.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).

<ppm of nominal> P% This tolerance is in ppm of the nominal value.

<ppm of range> P/ This tolerance is in ppm of range as entered in the RANGE field.

<absolute units>U Tolerance as an absolute value (units are the same as those used for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- Percentage of range (% of range)/ or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD3

This field is used in the 7405A system only and is used to specify two-wire accuracy enhancement for the 1.9 decade step values. If nothing is entered, no enhancement is used unless the tolerance is less than 1 ohm, and a 2W connection is specified. An E is automatically inserted if the previous conditions are true. A -E prevents automatic insertion. If E is specified, enhancement is used unless it is not applicable. A -E is not returned in the verified line.

MOD4

Determines the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON

Allows you to specify UUT connections. The system will default to a two-wire connection (2W). In the case of a 7405A system, in 2W the connection is to the Multifunction Output Source terminals; for the 1.9 TI panel values, a connection to the Resistance Source terminals is to be made.

If four-wire (4W) is specified, the additional connection points are requested. In the case of a 7405A system, the additional connection is to Multifunction Output Sense or Resistance Sense terminals. Four-wire does not apply to values over 10 kilohms for 5100B resistors and over 1.9 kilohms for TI panel fixed resistors.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the RESF FSC.

Memory Allocation

Normally, the UUT reading at the end of the test is saved (in Nominal units) in MEM1. If MOD4 is N, it is saved in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection, the operator is asked to make the required changes and press [ADV].

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV].

- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

DESCRIPTION

The RESV FSC programs the system to provide variable resistance stimulus (from 1 ohm to 20 megohm). The RESV FSC applies to the 7405A system ONLY, which uses a Test Interface (TI) panel specifically for this purpose.

Example:

```
STEP    FSC   RANGE   NOMINAL   TOLERANCE   MOD1   MOD2  3  4  CON
25.006  RESV  200     100Z      .23U                     N  2W
```

PARAMETERS

The following parameters apply the the RESV FSC.

Nominal

Nominal value for the test. If a Setup test, this parameter is the stimulus which will be programmed; otherwise, it is the reading of the UUT after the stimulus is slewed. It is entered by:

<nominal><prefix><units>

ALLOWED VALUES

The allowed values for the nominal are:

Resistance in ohms (Z)

1Z to 20MZ

Conductance in siemens (Y)

1Y to .05uY

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

OHMS	SIEMENS	VALUE	ASSIGNED
Z	Y	value of integer	
pZ or PZ	pY or PY	1E-12	p
nZ or NZ	nY or NY	1E-9	n
uZ or UZ	uY or UY	1E-6	u
mZ	mY or MY	1E-3	m
kZ or KZ	kY or KY	1E+3	K
MZ		1E+6	M
gZ or GZ	gY or GY	1E+12	G

- o A maximum of 14 characters is allowed for the Nominal value plus prefix plus units.

- o A Nominal of * (asterisk) sets the 5100B to standby and opens the TI panel relays. This test is a Setup, so MOD4 will automatically by assigned as S. If you enter a <RETURN> with no data as the RESV parameter entry, an * and S is assigned.

- o If units are entered without a Nominal value (e.g., Z), the nominal will be that of MEM plus the units specified.

Range

Specifies the UUT range per division in the units of the nominal value. The UUT range is entered by:

<range>R

After the line has been read and verified by the system, the R is removed (from the procedure record).

- o Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.

- If R is entered with no <range> data, no automatic range message will occur.

- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerance to which the UUT results are evaluated. The tolerances should reflect the instrument specifications of the UUT at the nominal value. This field may be up to 13 characters long, and any combination of up to three of the following entries (within the 13-character limit) may be used:

ENTRY	SPECIFICATION TYPE
<% of nominal>%	Tolerance as a percentage of the nominal value
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE) field.
<ppm of nominal>P%	Tolerance is in ppm of the nominal value.
<ppm of range>P/	This tolerance is in ppm of range as entered in the RANGE field.
<absolute units>U	Tolerance as an absolute value (units are the same as those used for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.

- If the tolerance is prefaced by a + (plus), then the tolerance is specified from the applied stimulus in a positive direction.

- If the tolerance is prefaced by a - (minus), then the tolerance is specified from the applied stimulus in a negative direction.

- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.

- % of range or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Not used

MOD2

Not used

MOD3

Not used

MOD4

Determines the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Normal PASS/FAIL test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons. The content of MEM remains unchanged.

S — Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed. The contents of MEM remains unchanged.

N — Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. The contents of MEM1 remains unchanged. This option is used in conjunction with the Compare test.

C — Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of evaluation, the system stimulus is compared to MEM instead of the nominal value. The system stimulus value is saved in MEM1. MEM will contain the value used for UUT INDICATED.

CON

Allows you to specify UUT connections to the TI panel. The system will default to a two-wire connection (2W) to the Resistance Source terminals. If 4W is specified, the system will solicit a connection to the Resistance Sense terminals as well.

MISCELLANEOUS

The following paragraphs contain miscellaneous information about the RESV FSC.

- Autoranging UUT's may not be used with RESV unless the autorange feature is disabled or locked.

- Use For Adjustments: Since the methodology used for RESV requires a stable UUT model, it is not recommended to use RESV where the UUT will be adjusted if this alters the UUT model. It is preferable to use RESF for adjustments.

Memory Allocation

Normally the system stimulus at the end of the test is saved in MEM1. It is saved in the nominal units. If MOD4 is N, MEM contains the final stimulus.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK- FSC:

- If a connection is different than the present connection to the TI panel, the operator is asked to make the required disconnections and connections, then press the [ADV] display key.

- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and press [ADV].

- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

Safety

This FSC will also provide associated stimulus at the Multifunction Output port. No connections should be made to these ports.

Setup Tests

If a Setup test is used and subsequently the UUT internal circuit characteristics are modified (e.g., in an adjustment), the simulated resistance may change.

DESCRIPTION

The RNG FSC allows you to specify a change in the UUT's Range with an automatic message. The RNG FSC is used in place of the DISP FSC for two reasons;

1. The message is identical in format to the other automatic messages.

2. It allows the system to remember the present range so an automatic message will not repeat during a future execution of the procedure. An example of the RNG FSC is shown below:

```
STEP    FSC  RANGE NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON
36.006  RNG        5mV
```

PARAMETERS

The following parameters apply to the RNG FSC.

Nominal

Specifies the value of the displayed Range message. The Nominal is entered as:

<range value><prefix> H or T or V or D or A or Y or Z or VP

ALLOWED PREFIXES

The 7411B interprets the prefix of the Nominal value as follows:

VOLTS	AMPS	DECBL	TIME	FREQ	SIEMENS	OHMS	VOLT/PK	MULTIPLIER
V	A	D	T	H	Y	Z	VP	10^{-12}
pV/PV	pA/PA		pT/PT	pH/PH	pY/PY	pZ/PZ	pVP/PVP	10^{-9}
nV/NV	nA/NA		nT/NT	nH/NH	nY/NY	nZ/NZ	nVP/NVP	10^{-6}
uV/UV	uA/UA		uT/UT	uH/UH	uY/UY	uZ/UZ	uVP/UVP	10^{-3}
mV/MV	mA/MA		mT/MT		mY/MY		mVP/MVP	10^{3}
V/KV	kA/KA		kT/KT	kH/KH	kY/KY	kZ/KZ	kVP/KVP	10^{6}
				mH/MH		mZ/MZ		10^{9}
gV/GV	gA/GA		gT/GT	gH/GH	gY/GY	gZ/GZ	gVP/GVP	

- A maximum of 15 characters is allowed for the nominal parameter.

- If the entry does not contain a numeric, the message defaults to Autorange.

MOD2

Specifies the mode of the automatic range message. The MOD2 entries are T, H, V, D, A, Y, Z, or VP. (Oscilloscope calibration systems such as the 7410A will add /Division.)

-D: (Applicable only for oscilloscope calibration systems such as the 7410A.) The automatic range message is specified in units of T or H or V or D or A or Y or Z or VP. (Note that there is no /Division.)

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the RNG FSC.

Memory Allocation

The contents of memory is not changed with the RNG FSC.

Automatic Messages

The following message is automatically displayed (if MOD2 is blank) by the system unless the message is disabled by the ASK+ and ASK- FSCs:

For oscilloscope calibration systems:

> Set UUT [MEM2] To The --- Sec or Hz or V or VP or dBm or A or Siemens or Ohms/Division Range...

For other calibration systems:

> Set UUT [MEM2] To The ___ (Sec, Hz, V, dBm, A, Siemens, or Ohms Range.)

If MOD2 is -D (for oscilloscope calibration systems only):

> Set UUT [MEM2] To The --- Sec or Hz or V or dBm or A or Siemens or Ohms Range...

DESCRIPTION

The RPT FSC unconditionally transfers control to the first step of the current test (repeats current UUT test). RPT should be used only in an adjustment routine. An example of the RPT FSC is shown below:

```
STEP   FSC RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
23.031 RPT
```

PARAMETERS

The RPT FSC does not use any of the parameter fields.

MISCELLANEOUS

The following miscellaneous information applies to the RPT FSC:

- The RPT FSC is equivalent to a JMP xx.001. The step number of the RPT is xx.abc. It is convenient to use the RPT FSC following indented UUT adjustments to repeat the test that caused the adjustment.

DESCRIPTION

The RSLT FSC has two modes of operation. In the first mode, the RSLT FSC displays the indicated message to the operator and then displays the Touch-Sensitive screen shown in Figure 3-1. The display allows the operator make a detailed response to the RSLT message. The entire operator response is placed in the results file. An example of the first mode of operation for the RSLT FSC is shown below:

```
STEP FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
     RSLT       {Enter the voltage at TP12:}
```

In the second mode, the RSLT FSC can be used to directly enter information into the results file. The second mode is activated by preceding the character string (to be entered into the results file) with an equals (=) sign. This mode is transparent to the operator. An example of the second RSLT FSC mode is shown below:

```
STEP FSC  RANGE NOMINAL  TOLERANCE  MOD1 MOD2  3  4  CON
     RSLT     =The voltage level at TP 12 should be 1.23V.
```

PARAMETERS

The following parameters apply to the RSLT FSC.

Nominal through CON

Specifies the single-line text message to be entered. The RSLT message line must conform to the following rules:

1. A maximum of 56 characters (45 characters if the line is preceded by an equals sign) is allowed for the message line.

2. Literal use of braces or square brackets is not allowed (see Special Constructions).

Special Constructions

The RSLT FSC uses several special constructions that expand its use. The following paragraphs describe these special constructions and their uses.

[MEM], [MEM1], and [MEM2]

The special constructions [MEM], [MEM1], and [MEM2] (square brackets included) will cause the value of MEM, MEM1, or MEM2 to be displayed to the operator. In the first mode, this value is not transferred literally to the Results file. In the second mode, the value of MEM, MEM1, or MEM2 is transferred to the Results file.

[<numeric>]

The special construction [<numeric>] (square brackets included) will cause the ASCII character, which corresponds to the numeric, to be printed. For example, [7] (ASCII character BELL) will cause the 1722A bell to ring.

[D<numeric>]

The special construction [D<numeric>] will cause a delay of the message line by <numeric> number of milliseconds. The available range is from 0 to 32767 milliseconds.

USE OF BRACES AND SQUARE BRACKETS

Braces and square brackets have the following special functions in the RSLT FSC:

- Any part of a RSLT message enclosed by braces is transferred directly to the results file when that line is executed.
- Items within square brackets are not transferred literally to the results file, unless the entire line is preceded with an equals sign.
- Square brackets are used to indicate a non-literal input (e.g., [MEM] will display the value stored in MEM).
- The entire line is transferred disregarding any braces present if it prefaced by an equal sign.

Since braces and square brackets are reserved for special functions in the DISP FSC, they cannot be used literally in a procedure line. The following special constructions must be used to print braces or square brackets:

- Use [91], to print a left square bracket ([).
- Use [93], to print a right square bracket (]).
- Use [123], to print a left brace ({).
- Use [125], to print a right brace (}).

In the first mode, data within braces ({ }) is included in the results. For example, the line:

```
RSLT Enter {Lab Temperature:}
```

is interpreted as shown in Figure 5-3.

If the operator enters "20.3 Degrees" the result line will be:

Lab Temperature: 20.3 Degrees

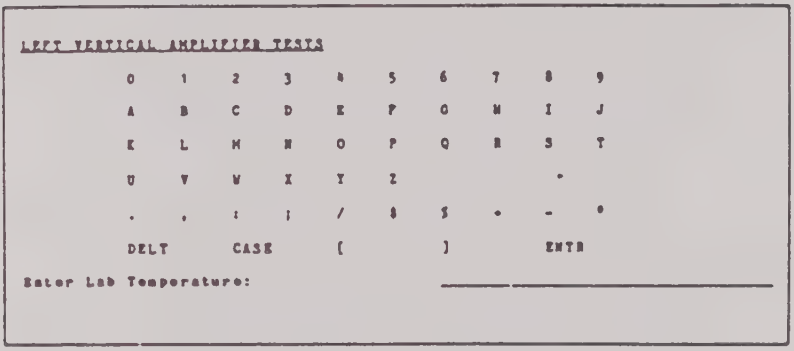

Figure 5-3. Sample RSLT Display

In the second mode, everything except braces is transferred to test results. For example:

RSLT =Lab Temperature is [MEM]

goes into the results as:

Lab Temperature is 68.5

if [MEM] is equal to 68.5

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the RSLT FSC.

Memory Allocation

The contents of Memory is not changed with the RSLT FSC.

Automatic Messages

There are no automatic messages with the RSLT FSC.

DESCRIPTION

The RUN FSC allows you to call a user-written BASIC program (residing on the procedure disk) to be executed. After the BASIC program has been executed the system returns to the calibration procedure on the next line following the RUN FSC line. An example of the RUN FSC is shown below:

```
STEP   FSC  RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
35.003 RUN        PROGRM
```

PARAMETERS

The following parameters apply to the RUN FSC.

Nominal

Specifies the name of the BASIC program to be executed. The Nominal entry must conform to the following rules:

1. A maximum of six alphanumeric (plus the optional three character .BAS extension) is allowed for the BASIC program name.

2. If no extension is specified, the system defaults to .BAS.

3. The program is run from MF0: (Disk Drive Zero in the 1722A) if the system is configured as floppy-disk based system or from WD0: (Partition zero of the Winchester Disk drive).

4. If the disk is not inserted or if the program is not present during procedure execution, an error message appears.

MISCELLANEOUS

- The BASIC program may perform any number of functions such as programming instruments or manipulating the data base. For details on the BASIC programming language, refer to the 1722A BASIC Programming Manual.

- The BASIC program must conclude with the statement:

  ```
  RUN 'INT1'
  ```

  This BASIC statement reenters the software to continue execution of the procedure.

- Since the use of the 'List, Copy, or Delete Data' option to copy procedures does not transfer BASIC programs, the procedure writer must manually copy these programs using FUP.

DESCRIPTION

The RUNE FSC allows you to call a user-written BASIC program and instructs the system to execute that program. A pass/fail evaluation will be generated (and test results will be saved) with this FSC in the same manner as other Evaluation FSCs. Evaluation FSCs also cause the integer part of the step number to change when writing the procedure. An example of the RUNE FSC is shown below:

```
STEP  FSC   RANGE  NOMINAL TOLERANCE  MOD1  MOD2  3  4  CON
      RUNE         TEST
```

PARAMETERS

Only the Nominal parameter applies to the RUNE FSC. The following paragraphs explain the use of the Nominal parameter for the RUNE FSC.

Nominal

Specifies the name of the user-written BASIC program. No other calibration procedure parameters apply for the RUNE FSC. The following rules apply to the RUNE FSC:

1. The program name may contain up to six alphanumeric characters with an extension of .BAS or .BAL.

2. The program is run from MF0: (Disk Drive Zero in the 1722A) if the system is configured as floppy-disk based system or from WD0: (Partition zero of the Winchester Disk drive).

3. If the disk (containing the BASIC program) is not inserted when the program is called or the system cannot find the program (e.g., program name is entered incorrectly or does not reside on the disk currently installed in drive 0), an error message appears.

User Program Name Requirements

The BASIC program, used in conjunction with the RUNE FSC, may perform a number of specialized functions. These functions may include tasks like programming instruments, manipulating test results, or manipulating the data base. Refer to the 1722A BASIC and BASIC Reference Guides for detailed information on BASIC programs.

The BASIC program, called with the RUNE FSC, should begin with the following opening and dimension:

```
CLOSEALL\OPEN'CONTRL.INT'ASOLDDIMFILE1%

DIM#1%,C0(83),C1%(73),C2$(42),C3$(89)=64,
C4%(274),CD%(32,5),CL$(17)=32
```

When the particular test result for the line has been determined, the result should be placed in C3$(2). It can be assigned in free format with the exception of columns 53 through 56. This is the field for the %TOL column of the results. It should be blank, PASS, FAIL, >500, or a positive integer between 0 and 500. C3$(2) will be displayed to the operator after the test and will also be placed in the results with the test number.

MISCELLANEOUS

The following paragraphs contain miscellaneous information for the RUNE FSC.

Reentering the Procedure

The BASIC program must conclude with the statements:

```
CLOSE 1%
RUN 'INT1'
```

This BASIC statement causes the system to reenter the 7411B Calibration software to continue the execution of the procedure.

Procedure Transfer

Since the use of the 'List, Copy, or Delete Data' option to copy procedures does not transfer BASIC programs, the procedure writer must manually copy these programs using FUP.

DESCRIPTION

The SET FSC generates a list of settings for complex UUT setups. When a SET FSC is encountered in a procedure, the message is displayed and inserted into a file following the rules defined below. During the Post-Test Summary, a [STEP] key is displayed. If this key is pressed, the most recent 18 entries from the SET file are displayed. Three basic constructions are used:

- Headings (which are simply text).
- Regular entries (which consist of a name followed by a colon and then a setting).
- Automatic settings (a name followed by a colon, a space, and an asterisk).

An example of the SET FSC is shown below:

```
STEP   FSC RANGE NOMINAL  TOLERANCE  MOD1  MOD2  3  4  CON
1.003  SET       CH1 Volts/Div: 5mV[DRAW60,15,F]
```

PARAMETERS

The following parameters apply to the SET FSC.

Nominal

Specifies the name and setting for the SET FSC. The nominal is entered as:

<name>: <setting>

NOTE

A space after the colon (:) is required

The two fields are separated by a colon followed by a space and must appear in the order indicated. Any colon not followed by a space is not considered a field separator.

The total length may be up to 56 characters including constructs. The length of the message may not exceed 32 characters, not including any special constructs.

All unique names are stored in a file in order of appearance with the following exceptions:

- If the name matches a name in the file and the settings are different, then the old setting in the file associated with that name is replaced by the new setting, and no new entry is created. The name and new setting are displayed to the operator. If the old and new settings are identical, then the new name and setting are ignored and not displayed to the operator.

- If a name is entered with no setting and the name matches a name in the file, then that entry is deleted from the file. If no match occurs, the FSC is ignored.

- If more than 18 names are present in the file, then the first (oldest) entry is deleted from the file, and the new name is added to the bottom.

If no separator (colon followed by a space) is entered, then a heading is assumed. The string is displayed and entered in the file and will remain in the file until it is bumped off. The string will not be updated as described in 3, above. This feature is very useful to set apart certain groups of settings (e.g., VERTICAL MODE CONTROLS or TRIGGERING CONTROLS).

If no data follows SET, then the entire SET file is deleted.

If an asterisk immediately follows a field separator (e.g., Volts/Div: *), then the following occurs:

- The current automatic range or RNG is entered as the <setting> for that <name> in the SET file.
- The setting is only displayed to the operator when the automatic range is updated. If the automatic range is not updated, no setting is displayed.
- The asterisk is not printed on the screen during SET execution or during a STEP listing from the Post-Test Summary. Only the automatic range appears (if it was updated).

Special Constructions

There are several special constructions that expand the use of the SET FSC. These special constructions are explained in the following paragraphs.

[D<numeric>]

The special construction [D<numeric>] causes a delay of the message line by <numeric> number of milliseconds. The available range is from 0 to 32767 milliseconds. Useful for specifying a settling time for UUTs.

[DRAW--,--,-)

The DRAW construction allows you to display a simple drawing of the UUT (with an blinking annunciator) to show the location of a control or an adjustment. This drawing appears on the right side of the 1722A display. The DRAW construction includes three modifiers (par1, par2, and par3). The DRAW construction is entered as:

DRAW<par1>,<par2>,<par3>

The three modifiers (<par1>, <par2>, and <par3>) are optional but the commas must still be entered. These modifiers are used for the following purposes:

- The <par1> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of height from the bottom of the drawing.

- The <par2> modifier is used to indicate the location of the annunciator within the drawing. The modifier is entered as a percentage of width from the left side of the drawing.

- The <par3> modifier is used to indicate the desired view of the UUT, either front (F), back (B), left side (L), right-side (R), top (T), or bottom/underside (U).

Specifying 0 (zero) for <par1> and <par2> causes the UUT drawing to be displayed without an annunciator.

Not specifying <par1> and <par2> (i.e., [DRAW,,par3]) causes the UUT drawing to be displayed and then allows you to interactively describe the position of the annunciator. In this case the system software will display four arrow display keys ([UP], [DOWN], [LEFT], and [RIGHT]) that will allow you to position the annunciator.

The normal mode of operation for the procedure writer would be to enter only two commas. For example, [DRAW,,F] would display the front of the DRAWING and allow the user to position the graphic annunciator. ENTER concludes FSC entry, and the parameters will be automatically inserted.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the SET FSC.

Memory Allocation

The contents of Memory is not changed with the SET FSC.

Automatic Messages

The SET message is displayed if either a 'no Name' or a '<name>: <setting>' is entered. The message is not displayed if the setting and name already exist, if no <setting> follows the <name>, or if the automatic range has not been updated since a setting of *.

If ASK- S is used, then the SET FSC messages will not be displayed. However, the SET results file is updated, and the operator may view it using the STEP option.

DESCRIPTION

The WIDE FSC instructs the system to request a wideband ac voltage (10 Hz to 10 MHz @ less than 3.16V) stimulus from the 5100B Calibrator Wideband Option. A 50-ohm termination must be used with the Wide Band Output of the 5100B Calibrator. An example of the WIDE FSC is shown below:

```
STEP FSC   RANGE NOMINAL    TOLERANCE     MOD1      MOD2  3  4  CON
     DISP         Connect 50-ohm feed-through to UUT input terminals
     WIDE   2     1.9V       .005U         5MH                  2W
```

PARAMETERS

The following parameters apply to the WIDE FSC.

Nominal

Specifies the Nominal value of the stimulus output for the test. If the test is a Setup (MOD4=S), then the Nominal value is the programmed stimulus output of the 5100B Calibrator; otherwise, it is the reading of the UUT after the stimulus is slewed. The Nominal value is entered as:

<nominal><prefix><units>

ALLOWED VALUES

The values allowed for Nominal are:

Volts, ac

300 uV to 3.1623V

Decibels (dBm into 50 ohms)

-57.5 dBm to 23 dBm

ALLOWED PREFIXES

The 7411B interprets the unit prefix of the Nominal value as follows:

VOLTS	DECIBELS	MULTIPLIER
V	D	1
pV or PV		10^{-12}
nV or NV		10^{-9}
uV or UV		10^{-6}
mV or MV		10^{-3}
kV or KV		10^{3}
gV or GV		10^{9}

- A maximum of 14 characters is allowed for the Nominal value plus units.
- A Nominal value of * (asterisk) sets the 5100B to Standby. This causes a Setup test, and MOD4 will automatically be set to S.
- If a <RETURN> is entered with no additional data, an * (asterisk) is implied.
- If units are entered without a Nominal value (e.g., mV), the Nominal value will be MEM plus the units specified.

Range

Specifies the UUT range per division in units of the Nominal Value. The UUT range is entered as:

<range>R

After the line has been read and verified by the system, the R is removed (from the procedure record). The following rules apply to the WIDE FSC Range Parameter:

- Range is not allowed in a Setup (S) test. Therefore, range is never allowed in an indented adjustment.
- If R is entered with no <range> data, no automatic range message will occur.
- If AR is specified, the automatic range message will be Autorange.

Tolerance

Specifies the tolerances that UUT results are evaluated against. The tolerances should reflect the instrument specifications of the UUT at the Nominal value.

A maximum of 13 characters are allowed for the tolerance specification. Any combination of the following entries (within the 13-character limit) may be used:

ENTRY	TOLERANCE SPECIFICATION
<% of nominal>%	Tolerance as a percentage of the nominal value.
<ppm of nominal> P%	This tolerance is in ppm of the nominal value.
<ppm of range> P/	This tolerance is in ppm of range as entered in the RANGE field.
<% of range>/	Tolerance as a percentage of the range (as specified in the RANGE field).
<absolute units>U	Tolerance as a absolute value (units are the same as those used for Nominal).

- If the tolerance is unsigned, the system defaults to +/- tolerance.
- If the tolerance is prefaced by + (plus), then the tolerance is specified from the applied stimulus in a positive direction.
- If the tolerance is prefaced by - (minus), then the tolerance is specified from the applied stimulus in a negative direction.
- A tolerance is not allowed with a Setup test. Therefore, tolerance is never allowed in an indented adjustment.
- Percentage of range (% of range/) or ppm of range is not allowed when Range is blank or with Autorange (AR).

MOD1

Specifies the frequency of the Nominal value stimulus (for ac tests). MOD1 is entered as:

<frequency><prefix> H

The values allowed for frequency are:

10 Hz to 10 MHz @ 300 uV to 3.1623V

The 7411B interprets MOD1 unit prefixes as follows:

UNITS	MULTIPLIER
none	1
p or P	10^{-12}
n or N	10^{-9}
u or U	10^{-6}
k or K	10^{3}
m or M	10^{6}
g or G	10^{9}

- A maximum of 14 characters is allowed for the frequency plus units.

- The frequency allows single-digit resolution. For example, 50H or 60H are allowed, but 55H is not.

MOD4

Determines the type of test being performed. Normally this column is left blank, indicating the standard PASS/FAIL evaluation test. There are three other tests available that (along with the evaluation test) are described in detail below:

ENTRY	TEST TYPE
(blank)	Normal pass/fail test. The operator slews system stimulus, and an evaluation based on the final stimulus is made. All automatic messages may appear. System stimulus is stored in MEM1. The stimulus value in units of the nominal and MOD1 is printed at the lower left of the display for safety reasons.
S	Setup test. The system programs the nominal value. The lower left of the display indicates the stimulus. No evaluations or results are generated, and the next procedure record is executed. The system does not accept entries in the RANGE or TOLERANCE field for a Setup test. The only automatic message that may appear is the connection message. System stimulus is stored in MEM1. The stimulus remains until cleared by another Setup test or until a results-generating FSC is executed.
N	Nominal Set test. The operator slews the system stimulus until the UUT reads the nominal value. The final system stimulus value is saved in MEM. No evaluation or results are generated. The next procedure line is executed immediately. This test may be used for frequency response testing initialization in conjunction with Compare tests.
C	Compare test. The test is performed exactly as if No Entry was made in MOD4. However, for the purpose of the evaluation, the system stimulus is compared to MEM instead of the nominal value. This process may be used in conjunction with the Nominal Set test for UUT frequency response tests. The system stimulus value is saved in MEM1.

CON

Allows you to specify UUT connections. The system will default to a two-wire connection (2W). Four-wire connections are not allowed for the WIDE FSC.

MISCELLANEOUS

The following paragraphs contain miscellaneous information on the WIDE FSC.

Memory Allocation

The last system stimulus of the test is normally saved (in Nominal units) in MEM1. If MOD4 is N, it is saved in MEM. If no Nominal value is specified (only units), the stimulus becomes the value in MEM.

Automatic Messages

The following messages will automatically be displayed by the system unless defeated with the ASK+ and ASK- FSCs:

- If a connection is different than the present connection, the operator is asked to make the required changes and then press [ADV].
- If the UUT range and/or function has changed from the last instrument-oriented FSC, the operator is asked to make the changes and then press [ADV].
- If there is a pending message (see the MESS FSC Description), that message is displayed followed by the slew message. A Setup produces no MESS lines or slew message.

50 Ohm Load

If the UUT does not have an internal 50-Ohm load (terminator), then you must inform the operator to connect such a device to the UUT output. (Refer to the DISP FSC for information on how to display messages to the operator.)

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